FREEWAY ANALYSIS – HCS LOS WORKSHEETS
CEQA BASELINE (2012)

AM/PM PEAK HOURS
<table>
<thead>
<tr>
<th>General Information</th>
<th>Site Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway/Direction of Travel</td>
<td>I-110/Northbound</td>
</tr>
<tr>
<td>From/To</td>
<td>South of C St</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>CEQA Baseline (2012)</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Flow Inputs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>4598 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain:</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>Grade % Length mi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calculate Flow Adjustments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>f_p</td>
<td>1.00</td>
</tr>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
<tr>
<td>f_HV = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)}</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Speed Inputs</th>
<th>Calc Speed Adj and FFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOS and Performance Measures</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>s_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
<td>V_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
</tr>
<tr>
<td>S</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>D = s_p / S</td>
<td>D = v_p / S</td>
</tr>
<tr>
<td>LOS</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td></td>
<td>pc/mi/ln</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Glossary</th>
<th>Factor Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
<td>E_R - Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>V - Hourly volume</td>
<td>f_{LV} - Exhibit 11-8</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>E_T - Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>f_{LC} - Exhibit 11-9</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td>f_p - Page 11-18</td>
</tr>
<tr>
<td>BFFS - Base free-flow speed</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
<td></td>
</tr>
</tbody>
</table>
# BASIC FREEWAY WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-110/Southbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)

## Flow Inputs
- **Volume, V**: 3284 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade %**:
- **Length**: mi

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_HV = 1/P_T(E_R - 1) + P_R(E_R - 1) = 1.000**

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

## LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**
  - **S**: 65.0 mph
  - **D = v_p / S**: 13.4 pc/mi/ln

## Design (N)
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-405/Northbound
- **From/To**: At Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)

### Flow Inputs
- **Volume, V**: 11854 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **$$f_p$$**: 1.00
- **$$E_T$$**: 1.5
- **$$E_R$$**: 1.2
- **$$E_{HV} = 1/(1+P_T(E_T - 1) + P_R(E_R - 1))$$**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5 ramps/mi
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - **$$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$$**: pc/h/lane
  - **S**: m/h
  - **D = $$v_p / S$$**: pc/mi/ln
  - **LOS**: F

### Design (N)
- **Operational (LOS)**
  - **$$v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$$**: pc/h/lane
  - **S**: m/h
  - **D = $$v_p / S$$**: pc/mi/ln

### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **$$v_p$$**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location
- **$$E_R$$**: Exhibits 11-10, 11-12
- **$$f_{LV}$$**: Exhibit 11-8
- **$$E_T$$**: Exhibits 11-10, 11-11, 11-13
- **$$f_{LC}$$**: Exhibit 11-9
- **$$f_p$$**: Page 11-18
- **LOS, S, FFS, $$v_p$$**: Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-405/Southbound
- **From/To**: At Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)

### Site Information
- **Oper.(LOS)**
- **Des.(N)**
- **Planning Data**

### Flow Inputs
- **Volume, V**: 7526 veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **AADT**: veh/day
- **%Trucks and Buses, P_T**: 0
- **Peak-Hr Prop. of AADT, K**:%
- **%RVs, P_R**: 0
- **Peak-Hr Direction Prop, D**: General Terrain: *Level*
- **DDHV = AADT x K x D**: veh/h
- **Grade**, **Length**, **% Up/Down**

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_p</td>
<td>1.00</td>
</tr>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
<tr>
<td>E_R</td>
<td>1.2</td>
</tr>
<tr>
<td>f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))</td>
<td>1.000</td>
</tr>
</tbody>
</table>

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Speed Inputs
- **f_{LW}**: mph
- **f_{LC}**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV})</td>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV})</td>
</tr>
<tr>
<td>S</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>C</td>
</tr>
<tr>
<td>E_R - Exhibits 11-10, 11-12</td>
<td>f_{LW} - Exhibit 11-8</td>
</tr>
<tr>
<td>E_T - Exhibits 11-10, 11-11, 11-13</td>
<td>f_{LC} - Exhibit 11-9</td>
</tr>
<tr>
<td>f_p - Page 11-18</td>
<td>TRD - Page 11-11</td>
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<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
<td></td>
</tr>
</tbody>
</table>

### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>v_p</td>
<td>Flow rate</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
</tr>
<tr>
<td>DDHV</td>
<td>Directional design hour volume</td>
</tr>
<tr>
<td>S</td>
<td>Speed</td>
</tr>
<tr>
<td>D</td>
<td>Density</td>
</tr>
<tr>
<td>FFS</td>
<td>Free-flow speed</td>
</tr>
<tr>
<td>BFFS</td>
<td>Base free-flow speed</td>
</tr>
<tr>
<td>E_R</td>
<td>Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>E_T</td>
<td>Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>f_p</td>
<td>Page 11-18</td>
</tr>
<tr>
<td>TRD</td>
<td>Page 11-11</td>
</tr>
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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
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<tr>
<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
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<tr>
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<td>8/6/2013</td>
</tr>
<tr>
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<td>AM Peak Hour</td>
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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | At Alondra Bl |
| Jurisdiction | CALTRANS |
| Analysis Year | CEQA Baseline (2012) |

## Flow Inputs

| Volume, V | 7619 veh/h |
| AADT     | veh/day  |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | General Terrain: |
| DDHV = AADT x K x D | Grade % Length mi |

## Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_R = 1.2 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)} \times 1.000 \)

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## Calc Speed Adj and FFS

| Lane Width | ft |
| f_LW | mph |
| f_LC | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

## LOS and Performance Measures

| Operational (LOS) | Design (N) |
| \( v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p) \) | Design LOS |
| S | mph |
| D = \( \frac{v_p}{S} \) | pc/mi/ln |
| LOS | C |
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| \( v_p \) - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Glossary

| N | Number of lanes |
| V | Hourly volume |
| \( v_p \) | Flow rate |
| LOS | Level of service |
| DDHV | Directional design hour volume |

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{HW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** At Alondra Bl
- **Jurisdiction:** CALTRANS
- **Analysis Year:** CEQA Baseline (2012)

### Flow Inputs
- **Volume, V:** 9832 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:** veh/h
- **DDHV = AADT x K x D:**

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)} \times 1.000 \)

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 5
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

### LOS and Performance Measures
- **Operational (LOS):** 2092 pc/h/ln
- **LOS:** E

### Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **Vp:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

### Design (N)
- **Design LOS:**
- **Design (N):**

### Factor Location
- **\( E_R - Exhibits \):** 11-10, 11-12
- **\( f_{LV} - Exhibit \):** 11-8
- **\( E_T - Exhibits \):** 11-10, 11-11, 11-13
- **\( f_{LC} - Exhibit \):** 11-9
- **\( f_p - Page \):** 11-18
- **TRD - Page \):** 11-11
- **LOS, S, FFS, v:p - Exhibits:** 11-2, 11-3
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Site Information**
  - **Highway/Direction of Travel**: I-710/Northbound
  - **From/To**: Between I-405 & Del Amo Bl

### Project Description
- **YTI Project - Port of Los Angeles**

### Site Information
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)

### Oper.(LOS) Des.(N) Planning Data

### Flow Inputs
- **Volume, V**: 7104 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV**: \(\frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)}\) 1.00

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - ***v_p = (V or DDHV) / (PHF x N x f_HV)*** 1889 pc/h/ln
  - **S**: 54.8 mph
  - **D = v_p / S**: 34.5 pc/mi/ln
  - **LOS**: D

### Design (N)
- **Design LOS**
  - \(v_p = (V or DDHV) / (PHF x N x f_{lvw})\) pc/h/ln
  - **S**: mph
  - \(D = v_p / S\) pc/mi/ln
  - **Required Number of Lanes, N**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **f_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_{lvw}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{lc}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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### Basic Freeway Segments Worksheet

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project – Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** Between I-405 & Del Amo
- **Jurisdiction:** CALTRANS
- **Analysis Year:** CEQA Baseline (2012)

#### Flow Inputs
- **Volume, V:** 8002 veh/h
- **AADT:** 8002 veh/day
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, P_T:** 0
- **%RVs, P_R:** 0
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** 8002 veh/h
- **General Terrain:** Level
- **Flow Inputs:**
  - **f_p:** 1.00
  - **E_T:** 1.5
  - **E_R:** 1.2
  - **f_hv = \frac{1}{f_p + E_T (E_R - 1) + P_T (E_R - 1)}:** 1.000

#### Calculate Flow Adjustments
- **Speed Inputs:**
  - **Lane Width:** ft
  - **Rt-Side Lat. Clearance:** ft
  - **Number of Lanes, N:** 4
  - **Total Ramp Density, TRD:** ramps/mi
  - **FFS (measured):** 55.0 mph
  - **Base free-flow Speed, BFFS:** mph

#### Design (N)
- **Operational (LOS):**
  - \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{hv} x f_p) \)
  - \( S = \frac{v_p}{D} \)
  - \( D = v_p / S \)
  - \( LOS = E \)

#### Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **V_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

---

**Flow Inputs Calculation:****

- **Volume, V:** 8002 veh/h
- **AADT:** 8002 veh/day
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, P_T:** 0
- **%RVs, P_R:** 0
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** 8002 veh/h
- **General Terrain:** Level

**Calculate Flow Adjustments:**

- **f_p:** 1.00
- **E_T:** 1.5
- **E_R:** 1.2
- **f_hv = \frac{1}{f_p + E_T (E_R - 1) + P_T (E_R - 1)}:** 1.000

**Speed Inputs:**

- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:** mph

**Design (N):**

- **Operational (LOS):**
  - \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{hv} x f_p) \)
  - \( S = \frac{v_p}{D} \)
  - \( D = v_p / S \)
  - \( LOS = E \)

**Glossary:**

- **N:** Number of lanes
- **V:** Hourly volume
- **V_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume
### Basic Freeway Segments Worksheet

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between PCH & Willow St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)

#### Flow Inputs

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>5943</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%RVs, P_R</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments

- \( f_p \) = 1.00
- \( E_T \) = 1.5
- \( E_R \) = 1.2
- \( f_{HV} = \frac{1}{1 + P_T (E_T - 1)} + P_R (E_R - 1) \) = 1.000

#### Speed Inputs

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

#### Speed Inputs

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<td>ramps/mi</td>
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<tr>
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<td>55.0 mph</td>
</tr>
<tr>
<td>BFFS</td>
<td>mph</td>
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#### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td>PC/ln</td>
</tr>
<tr>
<td>Design (N)</td>
<td>PC/ln</td>
</tr>
</tbody>
</table>

#### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **D**: Density
- **f_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

**Factor Location**

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{HV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- \( TRD \) - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
**BASIC FREEWAY SEGMENTS WORKSHEET**

<table>
<thead>
<tr>
<th>General Information</th>
<th>Site Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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</tbody>
</table>

### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>6759 veh/h</th>
<th>Peak-Hour Factor, PHF</th>
<th>0.94</th>
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<tbody>
<tr>
<td>AADT</td>
<td></td>
<td>%Trucks and Buses, P_T</td>
<td>0</td>
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<tr>
<td>Peak-Hr Prop. of AADT, K</td>
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<td>%RVs, P_R</td>
<td>0</td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
<td>General Terrain: Level</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td></td>
<td>Grade % Length mi</td>
<td></td>
</tr>
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</table>

### Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ E_R = 1.2 \]
\[ f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)}, \quad 1.000 \]

### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
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</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
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### Speed Inputs

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<td>ramps/mi</td>
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<td>FFS (measured)</td>
<td>55.0 mph</td>
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<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p ]</td>
<td>[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p ]</td>
</tr>
<tr>
<td>S</td>
<td>mph</td>
</tr>
<tr>
<td>D</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
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### Glossary

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
<th>[ E_R ] - Exhibits 11-10, 11-12</th>
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<tbody>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
<td>[ E_T ] - Exhibits 11-10, 11-11, 11-13</td>
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<tr>
<td>[ v_p ] - Flow rate</td>
<td>FFS - Free-flow speed</td>
<td>[ f_p ] - Page 11-18</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
<td>LOS, S, FFS, [ v_p ] - Exhibits 11-2, 11-3</td>
</tr>
</tbody>
</table>
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
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<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | North of Florence Av |
| Jurisdiction | CALTRANS |
| Analysis Year | CEQA Baseline (2012) |

## Project Description
YTI Project - Port of Los Angeles

## Flow Inputs

| Volume, V | 8916 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |

## Calculate Flow Adjustments

\[
E_R = 1.2 \\
E_T = 1.5 \\
f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} = 1.000 \\
\]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>LOS</th>
<th>Design (N)</th>
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<tr>
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<td>Design LOS</td>
</tr>
<tr>
<td>Design LOS</td>
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</table>

## Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- f_p - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- DDHV - Directional design hour volume

## Factor Location

- E_R - Exhibits 11-10, 11-12
- f_{LV} - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_{LC} - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)
- **Oper.(LOS)**
- **Des.(N)**
- **Planning Data**

### Site Information

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<td>JHQF\RU&amp;RPSDQ</td>
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<td>From/To</td>
<td>North of Florence Av</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
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<tr>
<td>Analysis Year</td>
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<td>Oper.(LOS)</td>
<td>YTI Project - Port of Los Angeles</td>
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<td>Analysis Year</td>
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<tr>
<td>Oper.(LOS)</td>
<td>YTI Project - Port of Los Angeles</td>
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### Flow Inputs

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<th>Value</th>
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<tbody>
<tr>
<td>Volume, V</td>
<td>7291 veh/h</td>
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<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%RVs, P_R</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain:</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>Grade</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
</tr>
<tr>
<td>Up/Down %</td>
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### Calculate Flow Adjustments

<table>
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<th>Formula</th>
<th>Value</th>
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<tbody>
<tr>
<td>f_p</td>
<td>1.00</td>
</tr>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
<tr>
<td>E_R</td>
<td>1.2</td>
</tr>
<tr>
<td>f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))</td>
<td>1.000</td>
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### Speed Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
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</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Input</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td>Design (N)</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV})</td>
<td>Design LOS</td>
</tr>
<tr>
<td>(V x f_p)</td>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV})</td>
</tr>
<tr>
<td>1939 pc/h/ln</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>60.9 mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>mph</td>
</tr>
<tr>
<td>31.8 pc/mi/ln</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>D</td>
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<tr>
<td>LOS</td>
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</table>

### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>v_p</td>
<td>Flow rate</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
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<td>DDHV</td>
<td>Directional design hour volume</td>
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<tr>
<td>S</td>
<td>Speed</td>
</tr>
<tr>
<td>D</td>
<td>Density</td>
</tr>
<tr>
<td>BFFS</td>
<td>Base free-flow speed</td>
</tr>
<tr>
<td>E_R</td>
<td>Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>f_{HV}</td>
<td>Exhibit 11-8</td>
</tr>
<tr>
<td>E_T</td>
<td>Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>f_L</td>
<td>Exhibit 11-9</td>
</tr>
<tr>
<td>f_p</td>
<td>Page 11-18</td>
</tr>
<tr>
<td>LOS, S, FFS, v_p</td>
<td>Exhibits 11-2, 11-3</td>
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</table>

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**HCS 2010™ Version 6.50**

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<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
<tr>
<td>Site Information</td>
<td>Highway/Direction of Travel I-710/Northbound</td>
</tr>
<tr>
<td>From/To</td>
<td>n/o I-105 and n/o Firestone</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
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<td>Analysis Year</td>
<td>CEQA Baseline (2012)</td>
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</table>

**Oper.(LOS)**

<table>
<thead>
<tr>
<th>Flow Inputs</th>
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<tbody>
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<td>DDHV = AADT x K x D</td>
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**Calculate Flow Adjustments**

\[
f_p = 1.00 \quad E_T = 1.5 \quad f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} = 1.000 \]

**Speed Inputs**

<table>
<thead>
<tr>
<th>Speed Inputs</th>
<th>Calc Speed Adj and FFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
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</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

**LOS and Performance Measures**

**Operational (LOS)**

\[
v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} x f_p)} = 2375 \quad \text{pc/h/ln} \]

\[
S = 51.5 \quad \text{mph} \]

\[
D = \frac{v_p}{S} = 46.1 \quad \text{pc/mi/ln} \]

**Design (N)**

\[
v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} x f_p)} = \text{pc/h/ln} \]

\[
S = \text{mph} \]

\[
D = \frac{v_p}{S} = \text{pc/mi/ln} \]

**Glossary**

| N | Number of lanes |
| V | Hourly volume  |
| v_p | Flow rate     |
| LOS | Level of service |
| DDHV | Directional design hour volume |

**Factor Location**

| E_R | Exhibits 11-10, 11-12 |
| f_{LV} | Exhibit 11-8 |
| E_T | Exhibits 11-10, 11-11, 11-13 |
| f_{LC} | Exhibit 11-9 |
| f_p | Page 11-18 |
| TRD | Page 11-11 |
| LOS, S, FFS, v_p | Exhibits 11-2, 11-3 |

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HCS 2010™ Version 6.50 Generated: 3/19/2014 5:34 PM
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: n/o I-105 & n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)
- **Oper.(LOS)**

#### Flow Inputs
- **Volume, V**: 8227 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_{HV} = \frac{1}{(1+P_T)(E_R - 1) + P_R(E_R - 1)}**: 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**
- **v_p = (V or DDHV) / (PHF x N x f_{HV})**: 2188 pc/h/ln
- **S**: 56.2 mph
- **D = v_p / S**: 38.9 pc/mi/ln

#### Design (N)
- **Design LOS**
- **v_p = (V or DDHV) / (PHF x N x f_{HV})**: pc/h/ln
- **S**: mph
- **D = v_p / S**: pc/mi/ln
- **Required Number of Lanes, N**

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

#### Factor Location
- **E_R - Exhibits 11-10, 11-12**, **f_{HV} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**, **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**, **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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### General Information

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

### Site Information

- **Highway/Direction of Travel**: SR-47 Northbound at Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)

### Flow Inputs

- **Volume, V**: 442 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: 
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: 

### Calculate Flow Adjustments

- **$f_p$**: 1.00
- **$E_T$**: 1.5
- **$E_R$**: 1.2
- **$f_{HV}$**: 1.00

### Speed Inputs

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph

### LOS and Performance Measures

- **Operational (LOS)**: Design (N)
  - **$v_p$**: 157 pc/h/ln
  - **$S$**: 55.0 mph
  - **$D = v_p / S$**: 2.9 pc/mi/ln
  - **LOS**: A

### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **$v_p$**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location

- **$E_T$**: Exhibits 11-10, 11-12
- **$f_L W$**: Exhibit 11-8
- **$E_T$**: Exhibits 11-10, 11-11, 11-13
- **$f_L C$**: Exhibit 11-9
- **$f_P$**: Page 11-18
- **LOS, S, FFS, $v_p$**: Exhibits 11-2, 11-3

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information

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### Site Information

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<th>SR-47 Southbound</th>
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### Flow Inputs

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<th>Volume, V (veh/h)</th>
<th>AADT (veh/day)</th>
<th>Peak-Hour Factor, PHF</th>
<th>%Trucks and Buses, PT</th>
<th>%RVs, PR</th>
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<td>756</td>
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**Calculate Flow Adjustments**

\[
f_p = 1.00 \\
E_T = 1.5 \\
f_{HV} = \frac{1}{f_p + E_T (E_T - 1) + P_R (E_T - 1)} \\
E_R = 1.2
\]

### Speed Inputs

<table>
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<tr>
<th>Lane Width</th>
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<td>Rt-Side Lat. Clearance</td>
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<tr>
<td>Number of Lanes, N</td>
<td>3</td>
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<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
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<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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**Calc Speed Adj and FFS**

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<th>Lane Width</th>
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<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>f_LC</td>
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<td>Number of Lanes, N</td>
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<tr>
<td>Total Ramp Density, TRD</td>
<td></td>
</tr>
<tr>
<td>FFS (measured)</td>
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</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
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**LOS and Performance Measures**

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**Design (N)**

<table>
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</table>

<table>
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<tr>
<th>Operational (LOS)</th>
</tr>
</thead>
</table>

\[
v_p = \frac{(V \text{ or } DDHV) \times (PHF \times N \times f_{HV} \times f_p))}{268 pc/h/ln} \\
S = \frac{55.0}{mph} \\
D = \frac{v_p}{S} \\
LOS = A \\
E_T - Exhibits 11-10, 11-12 \\
E_R - Exhibits 11-10, 11-11, 11-13 \\
f_{LC} - Exhibit 11-9 \\
f_p - Page 11-18 \\
TRD - Page 11-11 \\
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
\]

**Glossary**

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
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</thead>
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<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
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<tr>
<td>DDHV - Directional design hour volume</td>
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### BASIC FREEWAY SEGMENTS WORKSHEET

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<td><strong>Agency or Company</strong></td>
<td>Raju Associates</td>
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<tr>
<td><strong>Date Performed</strong></td>
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<td><strong>Analysis Time Period</strong></td>
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<td><strong>Highway/Direction of Travel</strong></td>
<td>SR-47/Westbound</td>
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<tr>
<td><strong>From/To</strong></td>
<td>at Vincent Thomas Bridge</td>
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<td><strong>Jurisdiction</strong></td>
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<table>
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<tr>
<th><strong>Oper.(LOS)</strong></th>
<th><strong>Des.(N)</strong></th>
<th><strong>Planning Data</strong></th>
</tr>
</thead>
</table>

#### Flow Inputs

- **Volume, V**: 2199 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %Trucks and Buses, P_T = 0
- **Peak-Hr Direction Prop, D**: %RVs, P_R = 0
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{(1+P_T(E_T - 1)) + P_R(E_R - 1)} \times 1.000 \)

#### Speed Inputs

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi

#### Calc Speed Adj and FFS

- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures

#### Design (N)

- **Design LOS**: Design (N)

#### Glossary

- \( N \) - Number of lanes
- \( S \) - Speed
- \( V \) - Hourly volume
- \( D \) - Density
- \( v_p \) - Flow rate
- **LOS** - Level of service
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume

---

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# BASIC FREEWAY WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: SR-47/Eastbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)

## Flow Inputs
- **Volume, V**: 2466 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- \( f_{HV} = \frac{1}{(1 + P_T) (E_T - 1) + P_R (E_R - 1)} \)

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

## Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

## LOS and Performance Measures
- **LOS**: Design (N)
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \)
  - \( S = 55.0 \text{ mph} \)
  - \( D = \frac{v_p}{S} = 23.9 \text{ pc/mi/ln} \)
- **Required Number of Lanes, N**

## Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

## Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_LW - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_LC - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: AM Peak Hour
- Project Description: YTI Project - Port of Los Angeles

### Site Information
- Highway/Direction of Travel: SR-91/Westbound
- From/To: East of Alameda St & Santa Fe
- Jurisdiction: CALTRANS
- Analysis Year: CEQA Baseline (2012)

### Site Information
- Oper.(LOS)
- Des.(N)
- Planning Data

### Flow Inputs
- Volume, V: 9841 veh/h
- AADT: 9841 veh/day
- Peak-Hr Prop. of AADT, K: 0
- Peak-Hr Direction Prop, D: 0
- DDHV = AADT x K x D: veh/h

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{[1 + P_T(E_T - 1) + P_R(E_R - 1)]} = 1.000 \)

### Speed Inputs
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 6
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 65.0 mph
- Base free-flow Speed, BFFS: mph

### LOS and Performance Measures
- Design (N)
  - Design LOS
  - Design (N)
  - Design LOS
  - Design LOS
  - Design LOS
  - Design LOS
  - Design LOS

### Glossary
- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

### Factor Location
- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LVW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- ** Analyst:** RA
- ** Agency or Company:** Raju Associates
- ** Date Performed:** 8/6/2013
- ** Analysis Time Period:** AM Peak Hour
- ** Project Description:** YTI Project - Port of Los Angeles

### Site Information
- ** Highway/Direction of Travel:** SR-91/Eastbound
- ** From/To:** East of Alameda St & Santa Fe
- ** Jurisdiction:** CALTRANS
- ** Analysis Year:** CEQA Baseline (2012)

### Oper.(LOS) [ ] Des.(N) [ ] Planning Data [ ]

### Flow Inputs

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<td>AADT</td>
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<td>DDHV = AADT x K x D</td>
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### Speed Inputs

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### Speed Adj and FFS

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<td>f_LC</td>
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<td>TRD Adjustment</td>
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<tr>
<td>FFS</td>
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### LOS and Performance Measures

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<tr>
<td>Design (N)</td>
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### Glossary

**N** - Number of lanes  
**S** - Speed  
**V** - Hourly volume  
**D** - Density  
**v_p** - Flow rate  
**LOS** - Level of service speed  
**DDHV** - Directional design hour volume  
**FFS** - Free-flow speed  
**BFFS** - Base free-flow speed  

**Factor Location**

- E_R - Exhibits 11-10, 11-12  
- v_p - Page 11-18  
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3  
- TRD - Page 11-11

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### General Information

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

### Site Information

- **Highway/Direction of Travel**: I-110/Northbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)

### Project Description

- **YTI Project - Port of Los Angeles**

### Flow Inputs

- **Volume, V**: 3127 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**:
- **Peak-Hr Direction Prop, D**:
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments

- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = \frac{f_p + E_T (E_R - 1)}{E_R (E_T - 1)}**: 1.000

### Speed Inputs

- **Lane Width**: ft
- **Rt.-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS

- **f_{LW}**: mph
- **f_{LC}**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures

#### Operational (LOS)

- **v_p = \frac{(V or DDHV) \times f_p}{PHF \times N \times f_{HV}}**: 832 pc/h/ln
- **S**: 65.0 mph
- **D = v_p / S**: 12.8 pc/mi/ln
- **LOS**: B

#### Design (N)

- **Design LOS**
- **Design (N)**
- **Required Number of Lanes, N**

### Glossary

- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **E_R**: Exhibits 11-10, 11-12
- **f_{LW}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS**: S, FFS, v_p
- **Exhibits 11-2, 11-3**

### Factor Location

- **LOS**: S, FFS, v_p
- **Exhibits 11-2, 11-3**
**General Information**  
**Site Information**

<table>
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**Project Description**  
YTI Project - Port of Los Angeles

**Oper.(LOS)**  
- **Des.(N)**  
- **Planning Data**

**Flow Inputs**

| Volume, V | 4575 | veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT | veh/day | %Trucks and Buses, P_T | 0 |
| Peak-Hr Prop. of AADT, K | | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D | General Terrain: | Level |
| DDHV = AADT x K x D | veh/h | Grade | % | Length | mi |

**Calculate Flow Adjustments**

| f_p | 1.00 | E_R | 1.2 |
| E_T | 1.5 | f_HV = 1/(1+P_T(E_T - 1) + P_R(E_R - 1)) | 1.00 |

**Speed Inputs**

| Lane Width | ft | f_LW | mph |
| Rt-Side Lat. Clearance | ft | f_LC | mph |
| Number of Lanes, N | 4 | | |
| Total Ramp Density, TRD | ramps/mi | TRD Adjustment | mph |
| FFS (measured) | 65.0 | mph | |
| Base free-flow Speed, BFFS | mph | |

**LOS and Performance Measures**

**Design (N)**

| Operational (LOS) | Design LOS |
| Design (N) | |
| v_p = (V or DDHV) / (PHF x N x f_jHV x f_p) | v_p = (V or DDHV) / (PHF x N x f_jHV x f_p) |
| S | pc/h/in |
| D = v_p / S | pc/mi/in |
| LOS | |
| C | |

**Glossary**

- N - Number of lanes  
- V - Hourly volume  
- v_p - Flow rate  
- LOS - Level of service  
- DDHV - Directional design hour volume

- S - Speed  
- D - Density  
- FFS - Free-flow speed  
- BFFS - Base free-flow speed  
- E_R - Exhibits 11-10, 11-12  
- f_LW - Exhibit 11-8  
- E_T - Exhibits 11-10, 11-11, 11-13  
- f_LC - Exhibit 11-9  
- f_p - Page 11-18  
- TRD - Page 11-11  
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3

---

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HCS 2010™ Version 6.50  
Generated: 3/19/2014  5:36 PM
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-405/Northbound |
| From/To                  | At Santa Fe Av |
| Jurisdiction             | CALTRANS |
| Analysis Year            | CEQA Baseline (2012) |

## Flow Inputs

| Volume, V                  | 9238 veh/h |
| AADT                       | veh/day |
| Peak-Hr Prop. of AADT, K   | %Trucks and Buses, $P_T$ |
| Peak-Hr Direction Prop, D  | %RVs, $P_R$ |
| DDHV = AADT x K x D        | veh/h |

## Calculate Flow Adjustments

| $f_p$           | 1.00 |
| $E_T$           | 1.5  |
| $E_R$           | 1.2  |

\[
E_{HV} = \frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)} 0.94
\]

## Speed Inputs

| Lane Width                 | ft |
| Number of Lanes, N         | 5  |
| Total Ramp Density, TRD    | ramps/mi |
| FFS (measured)             | 65.0 mph |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v_p = \frac{(V or DDHV) \times f_{HV}}{(PHF \times N \times f_p)}$</td>
<td>$v_p = \frac{(V or DDHV) \times f_{HV}}{(PHF \times N \times f_p)}$</td>
</tr>
<tr>
<td>S</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>D</td>
<td>pc/mi/ln</td>
</tr>
</tbody>
</table>

## Glossary

- N - Number of lanes
- V - Hourly volume
- $v_p$ - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

## Glossary

- E$_R$ - Exhibits 11-10, 11-12
- $f_{HV}$ - Exhibit 11-8
- E$_T$ - Exhibits 11-10, 11-11, 11-13
- $f_{LC}$ - Exhibit 11-9
- $f_p$ - Page 11-18
- LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3

## Factor Location

- E$_R$ - Exhibits 11-10, 11-12
- $f_{HV}$ - Exhibit 11-8
- E$_T$ - Exhibits 11-10, 11-11, 11-13
- $f_{LC}$ - Exhibit 11-9
- $f_p$ - Page 11-18
- TRD - Page 11-11

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file:///C:/TEMP/f2k45C8.tmpl 3/19/2014
### Basic Freeway Segments Worksheet

#### General Information

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<th>RA</th>
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<td>Raju Associates</td>
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<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<td>PM Peak Hour</td>
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<td>YTI Project - Port of Los Angeles</td>
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#### Site Information

| Highway/Direction of Travel | I-405/Southbound |
| From/To                     | At Santa Fe Av |
| Jurisdiction                | CALTRANS |
| Analysis Year               | CEQA Baseline (2012) |

#### Flow Inputs

<table>
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<tr>
<th>Volume, V</th>
<th>11313 veh/h</th>
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<tr>
<td>AADT</td>
<td>veh/day</td>
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<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain: Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \times 1.000 \)

#### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

#### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>( f_{LV} )</th>
<th>mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f_{LC} )</td>
<td>mph</td>
</tr>
</tbody>
</table>

#### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
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<tbody>
<tr>
<td>( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p) )</td>
<td>( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p) )</td>
</tr>
<tr>
<td>( S )</td>
<td>mph</td>
</tr>
<tr>
<td>( D = v_p / S )</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>F</td>
</tr>
</tbody>
</table>

#### Glossary

- \( N \) - Number of lanes
- \( S \) - Speed
- \( V \) - Hourly volume
- \( D \) - Density
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

<table>
<thead>
<tr>
<th>Factor Location</th>
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</thead>
<tbody>
<tr>
<td>( E_R ) - Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>( f_{LV} ) - Exhibit 11-8</td>
</tr>
<tr>
<td>( E_T ) - Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>( f_{LC} ) - Exhibit 11-9</td>
</tr>
<tr>
<td>( f_p ) - Page 11-18</td>
</tr>
<tr>
<td>LOS, S, FFS, ( v_p ) - Exhibits 11-2, 11-3</td>
</tr>
</tbody>
</table>

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: At Alondra Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)
- **Project Description**: YTI Project - Port of Los Angeles

### Flow Inputs
- **Volume, V**: 8768 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **fHV = 1/(1 + P_R(E_T - 1) + P_T(E_R - 1))**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **RT-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures
- **LOS**: Design (N)

#### Operational (LOS)
- \( v_p = \frac{(V \text{ or DDHV}) \times f_p}{(PHF \times N \times f_{HV})} \)
- \( S = \frac{1866}{61.9} \text{ pc/h/ln} \)
- \( D = \frac{v_p}{S} \)
- \( D = \frac{30.1}{pc/\text{mi/ln}} \)

#### Design LOS
- \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV})} \)
- \( S = \frac{\text{pc/h/ln}}{mph} \)
- \( D = \frac{\text{pc/\text{mi/ln}}}{mph} \)

### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: PM Peak Hour

## Site Information
- Highway/Direction of Travel: I-710/Southbound
- From/To: At Alondra Bl
- Jurisdiction: CALTRANS
- Analysis Year: CEQA Baseline (2012)
- Project Description: YTI Project - Port of Los Angeles
- Oper.(LOS) ✅

## Flow Inputs
- **Volume, V**: 7808 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{(1 + P_T (E_T - 1)) + P_R (E_R - 1)} \times 1.000 \)

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph

## LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

## Factor Location
- \( E_R \): Exhibits 11-10, 11-12
- \( f_{LV} \): Exhibit 11-8
- \( E_T \): Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \): Exhibit 11-9
- \( f_p \): Page 11-18
- \( TRD \): Page 11-11
- LOS, S, FFS, \( v_p \): Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

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<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | Between I-405 & Del Amo Bl |
| Jurisdiction | CALTRANS |

## Project Description

- YTI Project - Port of Los Angeles

## Flow Inputs

| Volume, V | 7699 veh/h |
| AADT | 1.2 |
| Peak-Hr Prop. of AADT, K | 0.0 |
| Peak-Hr Direction Prop, D | 0.94 |

### Calculate Flow Adjustments

\[
f_p = 1.00, \quad E_R = 1.2, \quad E_T = 1.5, \quad f_{HV} = \frac{1}{\left[1 + P_T(E_T - 1) + P_R(E_R - 1)\right]} \times 1.000
\]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 55.0 mph |

## LOS and Performance Measures

| Operational (LOS) | S - Speed |
| Design (N) | Design LOS |
| Design Number of Lanes | N - Number of lanes |

## Glossary

- N - Number of lanes
- V - Hourly volume
- D - Density
- \( V_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- FFS - Free-flow speed
- BFFS - Base free-flow speed
- E - Exhibit
- E_r - Exhibit 11-10, 11-12
- f_Lw - Exhibit 11-8
- f_Lc - Exhibit 11-9
- TRD - Page 11-11

## Factor Location

| HCS 2010™ Version 6.50 | Generated: 3/19/2014 5:37 PM |
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** Between I-405 & Del Amo Bl
- **Jurisdiction:** CALTRANS
- **Analysis Year:** CEQA Baseline (2012)

## Flow Inputs

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Volume, V (veh/h)</td>
<td>7021</td>
</tr>
<tr>
<td>AADT (veh/day)</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
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</tr>
<tr>
<td>Peak-Hour Factor, PHF, P_H</td>
<td>0.94</td>
</tr>
<tr>
<td>%Trucks and Buses, P_T, P_B</td>
<td>0</td>
</tr>
<tr>
<td>%RVs, P_R</td>
<td>0</td>
</tr>
<tr>
<td>General Terrain: Level</td>
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<tr>
<td>Grade % Up/Down %</td>
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</tr>
</tbody>
</table>

## Calculate Flow Adjustments

$$ f_p = 1.00 \quad E_R = 1.2 \quad f_{HV} = \frac{1}{f_p[f_p(1 - E_T) + f_p(E_p - 1)]} = 1.000 $$

## Speed Inputs

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width, ft</td>
<td></td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance, ft</td>
<td></td>
</tr>
<tr>
<td>Number of Lanes, N, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD, ramps/mi</td>
<td></td>
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<tr>
<td>FFS (measured), mph</td>
<td>55.0</td>
</tr>
<tr>
<td>Base free-flow Speed, mph</td>
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</tr>
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## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Design (N)</td>
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<tr>
<td>Design LOS</td>
<td></td>
</tr>
<tr>
<td>Design FFS</td>
<td></td>
</tr>
<tr>
<td>Required Number of Lanes, N</td>
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</table>

## Glossary

- **N:** Number of lanes
- **V:** Hourly volume
- **V_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume
- **S:** Speed
- **D:** Density
- **FFS:** Free-flow speed

## Factor Location

- **E_R:** Exhibits 11-10, 11-12
- **f_{LVW}:** Exhibit 11-8
- **E_T:** Exhibits 11-10, 11-11, 11-13
- **f_{LC}:** Exhibit 11-9
- **f_p:** Page 11-18
- **TRD:** Page 11-11
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour

### Site Information
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** Between PCH & Willow St
- **Jurisdiction:** CALTRANS
- **Analysis Year:** CEQA Baseline (2012)

### Project Description
- **YTI Project - Port of Los Angeles**

### Flow Inputs
- **Volume, V:** 5724 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:** %
- **Peak-Hr Direction Prop, D:** %
- **DDHV = AADT x K x D:** veh/h

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_R:** 1.2
- **E_T:** 1.5
- **f_HV = 1/(1+P_T(E_T - 1) + P_R(E_R - 1)):** 1.000

### Speed Inputs
- **Lane Width:** ft
- **RT-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 3
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:** mph

### Speed Calculations
- **Calc Speed Adj and FFS**
  - **f_LW:** mph
  - **f_LC:** mph
  - **TRD Adjustment:** mph
  - **FFS:** 55.0 mph

### LOS and Performance Measures
- **LOS:** E
- **PC = (V or DDHV) / (PHF x N x f_HV x f_p):** 2030 pc/h/ln
- **S:** 53.7 mph
- **D:** 37.8 pc/mi/ln

### Design (N)
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_HV x f_p):** pc/h/ln
  - **S:** mph
  - **D:** pc/mi/ln

### Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **f_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

### Factor Location
- **E_R:** Exhibits 11-10, 11-12
- **f_LW:** Exhibit 11-8
- **E_T:** Exhibits 11-10, 11-11, 11-13
- **f_LC:** Exhibit 11-9
- **f_p:** Page 11-18
- **TRD:** Page 11-11
- **LOS, S, FFS, v_p:** Exhibits 11-2, 11-3

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**BASIC FREEWAY SEGMENTS WORKSHEET**

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<td>Analyst: RA</td>
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<tr>
<td>Agency or Company: Raju Associates</td>
<td>From/To: Between PCH &amp; Willow St</td>
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<tr>
<td>Date Performed: 8/6/2013</td>
<td>Jurisdiction: CALTRANS</td>
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<tr>
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<td>Analysis Year: CEQA Baseline (2012)</td>
</tr>
<tr>
<td>Project Description: YTI Project - Port of Los Angeles</td>
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</tr>
</tbody>
</table>

**Flow Inputs**

<table>
<thead>
<tr>
<th>Volume, V (veh/h)</th>
<th>6148</th>
<th>Peak-Hour Factor, PHF</th>
<th>0.94</th>
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</thead>
<tbody>
<tr>
<td>AADT (veh/day)</td>
<td></td>
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<td>0.0</td>
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<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
<td>%RVs, P_R</td>
<td>0.0</td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
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<td>General Terrain: Level</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
<td>Grade % Length mi</td>
<td></td>
</tr>
</tbody>
</table>

**Calculate Flow Adjustments**

| f_p (1.00) | E_R (1.2) | \( f_{HV} = \frac{1}{1+P_T(E_T - 1)} + P_R(E_R - 1) \) (1.00) |

**Speed Inputs**

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

**Calc Speed Adj and FFS**

| f_LW | mph |
| f_LC | mph |
| TRD Adjustment | mph |
| FFS | 55.0 mph |

**LOS and Performance Measures**

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}))} \times f_p )</td>
<td>Design LOS</td>
</tr>
<tr>
<td>S</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>D</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>E</td>
</tr>
</tbody>
</table>

**Glossary**

| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| v_p - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

**Factor Location**

| E_R - Exhibits 11-10, 11-12 | f_LW - Exhibit 11-8 |
| E_T - Exhibits 11-10, 11-11, 11-13 | f_LC - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 |  |
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyzer</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
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</table>

## Site Information

<table>
<thead>
<tr>
<th>Site Information</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway/Direction of Travel</td>
<td>I-710/Northbound</td>
</tr>
<tr>
<td>From/To</td>
<td>North of Florence Av</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>CEQA Baseline (2012)</td>
</tr>
</tbody>
</table>

## Project Description

- **YTI Project - Port of Los Angeles**
- **Oper.(LOS)**
- **Des.(N)**
- **Planning Data**

## Flow Inputs

| Volume, V | 7264 veh/h |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | General Terrain: |
| DDHV = AADT x K x D | Grade % Length mi |

## Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5 |

## Flow Inputs

| Lane Width | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |

## Speed Inputs

| f_LW | mph |
| f_LC | mph |

## Calc Speed Adj and FFS

| TRD Adjustment | mph |
| FFS | 65.0 mph |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>x f_p</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>61.0 mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>D</td>
</tr>
</tbody>
</table>

## Glossary

| N | Number of lanes |
| V | Hourly volume |
| p | Flow rate |
| LOS | Level of service |
| DDHV | Directional design hour volume |

## Factor Location

| E_R | Exhibits 11-10, 11-12 |
| f_LW | Exhibit 11-8 |
| E_T | Exhibits 11-10, 11-11, 11-13 |
| f_LC | Exhibit 11-9 |
| f_p | Page 11-18 |
| LOS, S, FFS, v_p | Exhibits 11-2, 11-3 |

## Source

- HCS 2010
- Version 6.50
- Generated: 3/19/2014 5:38 PM
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** North of Florence Av
- **Jurisdiction:** CALTRANS
- **Analysis Year:** CEQA Baseline (2012)

#### Flow Inputs
- **Volume, V:** 8122 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:** %
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h
  
  - **Peak-Hour Factor, PHF:** 0.94
  - **%Trucks and Buses, P_T:** 0
  - **%RVs, P_R:** 0
  - **General Terrain:** Level
  - **Grade:** %
  - **Length:** mi
  - **Up/Down %**

#### Calculate Flow Adjustments
- **f_p**
- **E_R**
- **E_T**
- **f_hV** = \( \frac{1}{1 + \frac{P_T}{E_T}E_R - 1} \) 1.000

#### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed:** mph

#### LOS and Performance Measures
- **Operational (LOS):**
  - \( v_p = \frac{(V \text{ or DDHV}) \times \left( \text{PHF} \times N \times f_{hv} \right)}{f_p} \) pc/h/ln
  - \( S = \frac{v_p}{D} \) mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - **LOS:** E

#### Design (N)
- **Design LOS:**
  - \( v_p = \frac{(V \text{ or DDHV}) \times \left( \text{PHF} \times N \times f_{hv} \right)}{f_p} \) pc/h/ln
  - \( S = \frac{v_p}{D} \) mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - **Required Number of Lanes, N**

#### Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **v_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

#### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
BASIC FREEWAY SEGMENTS WORKSHEET

General Information

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<td>Raju Associates</td>
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<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
</tbody>
</table>

Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | n/o I-105 and n/o Firestone |
| Jurisdiction | CALTRANS |
| Analysis Year | CEQA Baseline (2012) |

Project Description

| YTI Project - Port of Los Angeles |

Flow Inputs

| Volume, V | 8003 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | veh/h |

Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5 |
| E_R | 1.2 |
| f_HV = \frac{1}{(1+P_T(E_T - 1) + P_R(E_R - 1))} | 1.000 |

Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

Calc Speed Adj and FFS

| f_LW | mph |
| f_LC | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

LOS and Performance Measures

| Operational (LOS) |
| Design (N) |
| v_p = \frac{(V or DDHV) / (PHF x N x f_HV x f_p)}{2128 pc/h/ln} |
| Design LOS |
| v_p = \frac{(V or DDHV) / (PHF x N x f_HV x f_p)}{pc/h/ln} |
| S | 57.5 mph |
| D | 37.0 pc/mi/ln |
| LOS | E |
| E_R - Exhibits 11-10, 11-12 |
| E_T - Exhibits 11-11, 11-13 |
| f_p - Page 11-18 |
| TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 |

Glossary

- N - Number of lanes
- V - Hourly volume
- f_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed
- E_R - Exhibits 11-10, 11-12
- E_T - Exhibits 11-11, 11-13
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Factor Location

- E_R - Exhibits 11-10, 11-12
- f_LW - Exhibit 11-8
- E_T - Exhibits 11-11, 11-13
- f_LC - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

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<tr>
<th>General Information</th>
<th>Site Information</th>
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<td>Analyst</td>
<td>Highway/Direction of Travel I-710/Southbound</td>
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<tr>
<td>Agency or Company</td>
<td>From/To n/o l-105 &amp; n/o Firestone</td>
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<td>Jurisdiction CALTRANS</td>
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<td>Analysis Year CEQA Baseline (2012)</td>
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#### Project Description
YTI Project - Port of Los Angeles

<table>
<thead>
<tr>
<th>Oper.(LOS)</th>
<th>Des.(N)</th>
<th>Planning Data</th>
</tr>
</thead>
</table>

#### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V (veh/h)</th>
<th>8739</th>
<th>Peak-Hour Factor, PHF</th>
<th>0.94</th>
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</thead>
<tbody>
<tr>
<td>AADT (veh/day)</td>
<td></td>
<td>Trucks and Buses, P_T</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K (%)</td>
<td></td>
<td>RVs, P_R</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
<td>General Terrain: Level</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
<td>Grade % Length mi</td>
<td></td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>f_p</th>
<th>1.00</th>
<th>E_R</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>E_T</td>
<td>1.5</td>
<td>f_{HV} = 1/[1+P_T(E_T - 1)] + P_R(E_R - 1)</td>
<td>1.000</td>
</tr>
</tbody>
</table>

#### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD (ramps/mi)</td>
<td></td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td></td>
</tr>
</tbody>
</table>

#### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>f_{LW}</th>
<th>mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_{LC}</td>
<td>mph</td>
</tr>
</tbody>
</table>

#### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV})</td>
<td>Design LOS</td>
</tr>
<tr>
<td>x f_p</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S = 52.9 mph</td>
<td></td>
</tr>
<tr>
<td>D = v_p / S = 43.9 pc/mi/ln</td>
<td></td>
</tr>
<tr>
<td>LOS E</td>
<td>pc/mi/ln</td>
</tr>
</tbody>
</table>

#### Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

**Factor Location**

- E_R - Exhibits 11-10, 11-12
- f_{LW} - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_{LC} - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3
### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel:** SR-47 Northbound at Cdre. Schuyler Heim Bridge
- **Jurisdiction:** CALTRANS
- **Analysis Year:** CEQA Baseline (2012)

### Flow Inputs
- **Volume, V:** 1021 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:** %
- **Peak-Hr Direction Prop, D:** veh/h
- **DDHV = AADT x K x D:**

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_T:** 1.5

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 3
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:** mph

### LOS and Performance Measures
- **Operational (LOS):**
  - \( v_p = \frac{(V \text{ or DDHV}) \times (PHF \times N \times f_{hv} \times f_p)}{362} \) pc/h/ln
  - \( S = 55.0 \) mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - \( LOS = A \)

### Design (N)
- **Design LOS:**
  - \( v_p = \frac{(V \text{ or DDHV}) \times (PHF \times N \times f_{hv} \times f_p)}{362} \) pc/h/ln
  - \( S = \) mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - **Required Number of Lanes, N**

### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **\( v_p - \) Flow rate**
- **FFS - Free-flow speed**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**

### Factor Location
- **\( E_T - \) Exhibits 11-10, 11-12**
- **\( f_{LW} - \) Exhibit 11-8**
- **\( E_T - \) Exhibits 11-10, 11-11, 11-13**
- **\( f_{LC} - \) Exhibit 11-9**
- **\( f_p - \) Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, \( v_p - \) Exhibits 11-2,**
  - **11-3**

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**General Information**  
**Site Information**  

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Parameter</th>
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<td>Analyst</td>
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<td>Highway/Direction of Travel</td>
<td>SR-47 Southbound</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
<td>From/To</td>
<td>at Cdre. Schuyler Heim Bridge</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<td>CALTRANS</td>
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</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Flow Inputs**  
- **Volume, V** 791 veh/h  
- **AADT** veh/day  
- **Peak-Hr Prop. of AADT, K**  
- **Peak-Hr Direction Prop, D**  
- **DDHV = AADT x K x D** veh/h  

**Calculate Flow Adjustments**  
- \( f_p = 1.00 \)  
- \( E_T = 1.5 \)  
- \( f_{HV} = \frac{1}{f_p + P_T \cdot (E_T - 1) + P_R \cdot (E_R - 1)} \cdot 1.000 \)

**Speed Inputs**  
- **Lane Width** ft  
- **Rt-Side Lat. Clearance** ft  
- **Number of Lanes, N** 3  
- **Total Ramp Density, TRD** ramps/mi  
- **FFS (measured)** 55.0 mph  
- **Base free-flow Speed, BFFS** mph  

**Calc Speed Adj and FFS**  
- **Calc Speed Adj** mph  
- **FFS** 55.0 mph  

**LOS and Performance Measures**  
- **Operational (LOS)**  
- \( v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p) \)  
- **S** 55.0 mph  
- **D = V_p / S** 5.1 pc/mi/in  
- **LOS**  

**Design (N)**  
- **Design LOS**  
- \( v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p) \)  
- **S** mph  
- **D = V_p / S** pc/mi/in  
- **Required Number of Lanes, N**  

**Glossary**  
- **N** - Number of lanes  
- **S** - Speed  
- **V** - Hourly volume  
- **D** - Density  
- **V_p** - Flow rate  
- **LOS** - Level of service  
- **DDHV** - Directional design hour volume  
- **FFS** - Free-flow speed  
- **BFFS** - Base free-flow speed  

**Factor Location**  
- **E_R** - Exhibits 11-10, 11-12  
- **f_{LVW** - Exhibit 11-8  
- **E_T** - Exhibits 11-10, 11-11, 11-13  
- **f_{LC** - Exhibit 11-9  
- **f_p** - Page 11-18  
- **TRD** - Page 11-11  
- **LOS, S, FFS, V_p** - Exhibits 11-2, 11-3
## BASIC FREEWAY WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)

### Flow Inputs
- **Volume, V**: 3015 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or DDHV}) \times f_p}{(PHF \times N \times f_{HV})} \times 1604 \) pc/h/ln
  - \( S \): 55.0 mph
  - \( D = \frac{v_p}{S} \): 29.2 pc/mi/ln

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **D**: Density
- **S**: Speed
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location
- **LOS - Level of service**
  - \( E_R \): Exhibits 11-10, 11-12
  - \( f_{LV} \): Exhibit 11-8
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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</tr>
<tr>
<td>Analysis Time Period</td>
</tr>
<tr>
<td>Project Description</td>
</tr>
</tbody>
</table>

### Oper.(LOS)

<table>
<thead>
<tr>
<th><strong>Flow Inputs</strong></th>
<th><strong>Calculate Flow Adjustments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>2690 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Speed Inputs

<table>
<thead>
<tr>
<th><strong>Calc Speed Adj and FFS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
</tr>
<tr>
<td>FFS (measured)</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th><strong>Design (N)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)^1.431</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>D = v_p / S</td>
</tr>
<tr>
<td>LOS</td>
</tr>
</tbody>
</table>

### Glossary

<table>
<thead>
<tr>
<th><strong>Factor Location</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
</tr>
<tr>
<td>V - Hourly volume</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
</tr>
<tr>
<td>LOS - Level of service</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
</tr>
</tbody>
</table>

---

**Calculate Flow Adjustments**

\[ f_p = 1.00 \]

\[ E_R = 1.2 \]

\[ E_T = 1.5 \]

\[ f_{HV} = \frac{1}{1 + P_T + (E_T - 1) 	imes P_R (E_R - 1)} \times 1.00 \]

### Design (N)

**Design LOS**

\[ v_p = \frac{(V or DDHV)}{(PHF x N x f_{HV} x f_p)} \]

\[ S = 55.0 \text{ mph} \]

\[ D = v_p / S \]

**Required Number of Lanes, N**

---

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel:** SR-91/Westbound
- **From/To:** East of Alameda St & Santa Fe
- **Jurisdiction:** CALTRANS
- **Analysis Year:** CEQA Baseline (2012)

### Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>7082  veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>veh/h</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td></td>
</tr>
<tr>
<td>Peak-Hour Factor, PHF</td>
<td>0.94</td>
</tr>
<tr>
<td>%Trucks and Buses, P_T</td>
<td>0</td>
</tr>
<tr>
<td>%RVs, P_R</td>
<td>0</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Formula</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f_p )</td>
<td>1.00</td>
</tr>
<tr>
<td>( E_T )</td>
<td>1.5</td>
</tr>
<tr>
<td>( f_{HV} )</td>
<td>1.000</td>
</tr>
</tbody>
</table>

### Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>6</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0  mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### Design (N)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design LOS</td>
<td></td>
</tr>
<tr>
<td>Design N</td>
<td></td>
</tr>
</tbody>
</table>

### Glossary

- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

---

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: SR-91/Eastbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: CEQA Baseline (2012)

#### Flow Inputs
- **Volume, V**: 9129 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, PT**: 0
- **%RVs, PR**: 0
- **General Terrain**: Level
- **Grade %**:
- **Length mi**:
- **Up/Down %**:

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/f_p [E_R/E_T + E_T/E_R - 1]**: 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 6
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **LOS**: Design (N)
- **Operational (LOS)**: Design (N)
- **v_p = (V or DDHV) / (PHF x N x f_HV)**: pc/h/ln
- **S**: 64.3 mph
- **D = v_p / S**: pc/mi/ln
- **LOS**: C

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

#### Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_LW - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_LC - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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PROPOSED PROJECT (2026)

AM/PM PEAK HOURS
**BASIC FREEWAY WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-110/Northbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

### Flow Inputs
- **Volume, V**: 6392 veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- \[ f_p = 1.00 \]
- \[ E_T = 1.5 \]
- \[ E_R = 1.2 \]
- \[ f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1)) \]

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS
- \[ f_{LW} \]
- \[ f_{LC} \]
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures
- **LOS**: Design (N)
- **Design LOS**
- **Required Number of Lanes, N**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location
- \[ E_R - Exhibits 11-10, 11-12 \]
- \[ f_{LW} - Exhibit 11-8 \]
- \[ E_T - Exhibits 11-10, 11-11, 11-13 \]
- \[ f_{LC} - Exhibit 11-9 \]
- \[ f_p - Page 11-18 \]
- \[ TRD - Page 11-11 \]
- \[ LOS, S, FFS, v_p - Exhibits 11-2, 11-3 \]

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

#### Site Information
- **Highway/Direction of Travel**: I-110/Southbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

#### Project Description
- **Project**: YTI Project - Port of Los Angeles

### Flow Inputs
<table>
<thead>
<tr>
<th>Volume, V</th>
<th>4492</th>
<th>Peak-Hour Factor, PHF</th>
<th>0.94</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td>veh/day</td>
<td>%Trucks and Buses, P_T</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
<td>%RVs, P_R</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
<td>General Terrain:</td>
<td>Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
<td>Grade</td>
<td>%</td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1 + P_T (E_T - 1)}{E_R (E_T - 1)} \)
- \( E_R = 1.2 \)

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**

#### Calc Speed Adj and FFS
- \( f_{LW} \)
- \( f_{LC} \)
- **TRD Adjustment**
- **FFS**

#### LOS and Performance Measures
- **Operational (LOS)**
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}} \times f_p) \)
- \( S = 65.0 \text{ mph} \)
- \( D = \frac{v_p}{S} \)
- **LOS**

#### Design (N)
- **Design LOS**
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}} \times f_p) \)
- \( S \)
- **D = \frac{v_p}{S} \text{ pc/mi/ln}**
- **Required Number of Lanes, N**

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

#### Factor Location
- \( E_R \text{ - Exhibits 11-10, 11-12} \)
- \( f_{LW} \text{ - Exhibit 11-8} \)
- \( E_T \text{ - Exhibits 11-10, 11-11, 11-13} \)
- \( f_{LC} \text{ - Exhibit 11-9} \)
- \( f_p \text{ - Page 11-18} \)
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information

<table>
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<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
<tr>
<td>Highway/Direction of Travel</td>
<td>I-405/Northbound</td>
</tr>
<tr>
<td>From/To</td>
<td>at Santa Fe Av</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>Proposed Project (2026)</td>
</tr>
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</table>

### Site Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Site Information</td>
<td></td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of LA</td>
</tr>
<tr>
<td>Highway/Direction of Travel</td>
<td>I-405/Northbound</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>Proposed Project (2026)</td>
</tr>
</tbody>
</table>

### Flow Inputs

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>12796 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>9veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain: Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>Grade % Length mi Up/Down %</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{E_R(1 + f_T(E_T - 1)) + P_T(E_R - 1)} \times 1.000 \)

### Speed Inputs

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/MI</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_LW</td>
<td>mph</td>
</tr>
<tr>
<td>f_LC</td>
<td>mph</td>
</tr>
<tr>
<td>TRD Adjustment</td>
<td>mph</td>
</tr>
<tr>
<td>FFS</td>
<td>65.0 mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td>Design (N)</td>
</tr>
<tr>
<td>( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} )</td>
<td>Design LOS</td>
</tr>
<tr>
<td>S</td>
<td>40.2 mph</td>
</tr>
<tr>
<td>D</td>
<td>67.8 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>F</td>
</tr>
</tbody>
</table>

### Design (N)

- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \)
- Design LOS
- Design (N)

### Glossary

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
<td>S - Speed</td>
</tr>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>( v_p ) - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{HV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_T \) - Page 11-18
- \( TRD \) - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
### General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
</tbody>
</table>

### Site Information

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>I-405/Southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>From/To</td>
<td>at Santa Fe Av</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>Proposed Project (2026)</td>
</tr>
</tbody>
</table>

### Flow Inputs

| Volume, V | 8892 veh/h |
| AADT      | veh/day    |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

### Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5  |

\[ E_R = 1.2 \]

\[ f_{HV} = \frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)} 1.000 \]

### Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |

### Calc Speed Adj and FFS

| f_LW | mph |
| f_LC | mph |

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>D = v_p / S</td>
</tr>
</tbody>
</table>

### Design (N)

<table>
<thead>
<tr>
<th>Design LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>D = v_p / S</td>
</tr>
</tbody>
</table>

### Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- v_p - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- BFFS - Base free-flow speed
- DDHV - Directional design hour volume

### Factor Location

- E_R - Exhibits 11-10, 11-12
- f_{HV} - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_LC - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11

| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 |
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour

### Site Information
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** at Alondra Bl
- **Jurisdiction:** CALTRANS
- **Analysis Year:** Proposed Project (2026)

### Project Description
- **YTI Project - Port of Los Angeles**

### Flow Inputs
- **Volume, V:** 8128 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h

### Calculate Flow Adjustments
- \( f_p \) = 1.00
- \( E_T \) = 1.5
- \( E_R \) = 1.2
- \( f_{HV} = \frac{1}{1 + \frac{P_T}{E_T} + \left(\frac{E_R}{1 - E_R}\right)} \) = 1.000

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 5
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

### Calc Speed Adj and FFS
- **Speed Inputs**
  - \( f_LW \) = mph
  - \( f_{LC} \) = mph
- **FSR Adjustment**
  - TRD Adjustment = mph
  - FFS = 65.0 mph

### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{V \times DDHV}{PHF \times N \times f_{HV}} \) = 1729 pc/h/ln
  - \( S \) = 63.5 mph
  - \( D = \frac{v_p}{S} \) = 27.2 pc/mi/ln
  - **LOS**

### Design (N)
- **Design LOS**
  - \( v_p = \frac{V \times DDHV}{PHF \times N \times f_{HV}} \) = pc/h/ln
  - \( S \) = mph
  - \( D = \frac{v_p}{S} \) = pc/mi/ln
  - **Required Number of Lanes, N**

### Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **v_p:** Flow rate
- **FFS:** Free-flow speed
- **LOS:** Level of service
- **BFFS:** Base free-flow speed
- **DDHV:** Directional design hour volume

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### BASIC FREEWAY SEGMENTS WORKSHEET

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<td>Analyst</td>
<td>RA</td>
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<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
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<td>AM Peak Hour</td>
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<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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<td></td>
<td></td>
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</tbody>
</table>

### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>10588 veh/h</th>
<th>Peak-Hour Factor, PHF</th>
<th>0.94</th>
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</thead>
<tbody>
<tr>
<td>AADT</td>
<td>veh/day</td>
<td>%Trucks and Buses, P_T</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT</td>
<td>K</td>
<td>%RVs, P_R</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
<td>General Terrain:</td>
<td>Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
<td>Grade</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length</td>
<td>mi</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- \( f_P \) = 1.00
- \( E_T \) = 1.5

\[
E_R = 1.2
\]

\[
f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \times 1.00
\]

### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
<th>( f_{LW} )</th>
<th>mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
<td>( f_{LC} )</td>
<td>mph</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
<td>TRD Adjustment</td>
<td>mph</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
<td>FFS</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

- Design (N)
- Design LOS
- Required Number of Lanes, N

### Glossary

- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

## Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between I-405 & Del Amo
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

## Project Description
- **Project**: YTI Project - Port of Los Angeles

## Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>8758</td>
</tr>
<tr>
<td>AADT veh/day</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D veh/h</td>
<td></td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

\[
E_R = 1.2 \\
E_T = 1.5 \\
f_{p} = 1.00 \\
f_{HV} = \frac{1}{f_{p} + f_{T} + f_{R} - 1} = 1.000
\]

## Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_{LW}</td>
<td></td>
</tr>
<tr>
<td>f_{LC}</td>
<td></td>
</tr>
<tr>
<td>TRD Adjustment</td>
<td></td>
</tr>
<tr>
<td>FFS</td>
<td>55.0 mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p (V or DDHV) / (PHF x N x f_{HV} x f_{p})</td>
<td>2329 pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>48.1 mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>48.4 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>F</td>
</tr>
</tbody>
</table>

## Glossary

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
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<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>v_p</td>
<td>Flow rate</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
</tr>
<tr>
<td>DDHV</td>
<td>Directional design hour</td>
</tr>
<tr>
<td>S</td>
<td>Speed</td>
</tr>
<tr>
<td>D</td>
<td>Density</td>
</tr>
<tr>
<td>F</td>
<td></td>
</tr>
<tr>
<td>E_R</td>
<td>Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>E_T</td>
<td>Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>f_{LW}</td>
<td>Exhibit 11-8</td>
</tr>
<tr>
<td>f_{LC}</td>
<td>Exhibit 11-9</td>
</tr>
<tr>
<td>f_p</td>
<td>Page 11-18</td>
</tr>
<tr>
<td>TRD</td>
<td>Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, v_p</td>
<td>Exhibits 11-2, 11-3</td>
</tr>
</tbody>
</table>

## Factor Location

- E_R - Exhibits 11-10, 11-12
- f_{LW} - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_{LC} - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information

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<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
</tbody>
</table>

#### Site Information

- Highway/Direction of Travel: I-710/Southbound
- From/To: Between I-405 & Del Amo BL
- Jurisdiction: CALTRANS
- Analysis Year: Proposed Project (2026)

#### Project Description
- YTI Project - Port of Los Angeles

#### Flow Inputs

| Volume, V | 9197 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT      | veh/day    | %Trucks and Buses, P_T | 0   |
| Peak-Hr Prop. of AADT, K | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | veh/h | Grade % | Length mi |

#### Calculate Flow Adjustments

| f_p | 1.00 | E_R | 1.2 |
| E_T | 1.5  | f_HV = 1/[1+P_T(1-E_T) + P_R(E_R-1)] | 1.000 |

#### Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 55.0 mph |
| Base free-flow Speed, BFFS | mph |

#### LOS and Performance Measures

| Operational (LOS) | Design (N) |
| v_p = (V or DDHV) / (PHF x N x f_HV) x f_p | Design LOS |
| S | mph |
| D = v_p / S | pc/mi/ln |
| LOS | F |

#### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11

#### Factor Location

- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **Jurisdiction**: CALTRANS
- **From/To**: Between PCH & Willow St
- **Analysis Year**: Proposed Project (2026)

## Flow Inputs
- **Volume, V**: 7979 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0%
- **%RVs, P_R**: 0%

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_HV = 1/(1+P_T(E_T - 1) + P_R(E_R - 1))**: 1.00

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

## Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

## LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**
- **Required Number of Lanes, N**

## Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_LW - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_LC - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
### Basic Freeway Segments Worksheet

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** Between PCH & Willow St
- **Jurisdiction:** CALTRANS
- **Analysis Year:** Proposed Project (2026)

#### Flow Inputs
- **Volume, V:** 8685 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:** %
- **Peak-Hr Direction Prop, D:** General Terrain: Level
- **DDHV = AADT x K x D:** veh/h

#### Calculate Flow Adjustments
- **f_p** = 1.00
- **E_R** = 1.2
- **E_T** = 1.5
- **f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)}** = 1.000

#### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 3
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:** mph

#### Speed Adjustments and FFS
- **Calc Speed Adj and FFS**
  - **f_{LW}**
  - **f_{LC}**
  - **TRD Adjustment**
  - **FFS**

#### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = \frac{(V + DDHV) \times f_p}{PHF N}** = 3080 pc/h/ln
  - **S** = 14.5 mph
  - **D = \frac{v_p}{S}** = 211.7 pc/mi/ln
  - **LOS**

#### Design (N)
- **Design LOS**
  - **v_p = \frac{(V + DDHV) \times f_p}{PHF N}** = pc/h/ln
  - **S** = mph
  - **D = \frac{v_p}{S}** = pc/mi/ln
  - **Required Number of Lanes, N**

#### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **v_p** - Flow rate
- **FFS** - Free-flow speed
- **LOS** - Level of service
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume

---

**Factor Location**
- **E_R** - Exhibits 11-10, 11-12
- **f_{LW}** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

#### Flow Inputs
- **Volume, V**: 9245 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)} \times 1.000 \)

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{V}{N} \times f_{HV} \times f_p \)
  - \( S \): 49.1 mph
  - \( D = \frac{v_p}{S} \)
  - \( LOS \): F

#### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **LOS** - Level of service
- **FFS** - Free-flow speed
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume

---

**Factors Location**

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** North of Florence Av
- **Jurisdiction:** CALTRANS
- **Analysis Year:** Proposed Project (2026)

## Flow Inputs
- **Volume, V:** 7697 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_T:** 1.5
- **E_R:** 1.2
- **f_{HV} = \frac{1}{1+P_R(E_T - 1) + P_R(E_R - 1)}:** 1.000

## Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

### Calc Speed Adj and FFS
- **f_{LW}:** mph
- **f_{LC}:** mph
- **TRD Adjustment:** mph
- **FFS:** 65.0 mph

## LOS and Performance Measures
- **Operational (LOS):**
  - **v_p = \frac{(V or DDHV) / (PHF x N x f_{HV})}{x f_p}:** 2047 pc/h/ln
  - **S:** 59.1 mph
  - **D = v_p / S:** 34.7 pc/mi/ln
- **LOS:** D

### Design (N)
- **Design LOS:**
  - **v_p = \frac{(V or DDHV) / (PHF x N x f_{HV})}{x f_p}:** pc/h/ln
  - **S:** mph
  - **D = v_p / S:** pc/mi/ln
- **Required Number of Lanes, N:**

## Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **v_p:** Flow rate
- **FFS:** Free-flow speed
- **LOS:** Level of service
- **BFFS:** Base free-flow speed
- **DDHV:** Directional design hour volume

## Factor Location
- **E_R:** Exhibits 11-10, 11-12
- **f_{LW}:** Exhibit 11-8
- **E_T:** Exhibits 11-10, 11-11, 11-13
- **f_{LC}:** Exhibit 11-9
- **f_p:** Page 11-18
- **TRD:** Page 11-11
- **LOS, S, FFS, v_p:** Exhibits 11-2, 11-3

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

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<th>Analyst</th>
<th>RA</th>
<th>Site Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
<td>Highway/Direction of Travel I-710/Northbound</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
<td>From/To</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
<td>n/o I-105 and n/o Firestone</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
<td></td>
</tr>
</tbody>
</table>

Flow Inputs

| Volume, V (veh/h) | 9237 | Peak-Hour Factor, PHF | 0.94 |
| AADT (veh/day)    |      | %Trucks and Buses, P_T | 0    |
| Peak-Hr Prop. of AADT, K |    | %RVs, P_R             | 0    |
| Peak-Hr Direction Prop, D |    | General Terrain: Level |
| DDHV = AADT x K x D (veh/h) | | Grade | % |

Calculate Flow Adjustments

| f_p | 1.00 | E_R | 1.2 |
| E_T | 1.5  | f_p | 1/1+P_T(1-E_T) + P_R(E_R - 1] 1.000 |

Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width (ft)</th>
<th></th>
<th>Calc Speed Adj and FFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance (ft)</td>
<td></td>
<td>f_LW</td>
</tr>
<tr>
<td>Number of Lanes, N (4)</td>
<td></td>
<td>f_LC</td>
</tr>
<tr>
<td>Total Ramp Density, TRD (ramps/mi)</td>
<td></td>
<td>TRD Adjustment</td>
</tr>
<tr>
<td>FFS (measured) (65.0 mph)</td>
<td></td>
<td>FFS</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS (mph)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_p x f_p)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>x f_p</td>
<td></td>
</tr>
<tr>
<td>S (49.2 mph)</td>
<td></td>
</tr>
<tr>
<td>D = v_p / S</td>
<td></td>
</tr>
<tr>
<td>LOS</td>
<td></td>
</tr>
</tbody>
</table>

Glossary

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

Factor Location

| E_R - Exhibits 11-10, 11-12 | f_LW - Exhibit 11-8 |
| E_T - Exhibits 11-10, 11-11, 11-13 | f_LC - Exhibit 11-9 |
| f_p - Page 11-18 | |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 | |

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# BASIC FREEWAY WORKSHEET

## General Information

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
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<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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## Site Information

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<table>
<thead>
<tr>
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<tr>
<td>Highway/Direction of Travel</td>
<td>I-710/Southbound</td>
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<tr>
<td>From/To</td>
<td>n/o I-105 &amp; n/o Firestone</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
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<td>Analysis Year</td>
<td>Proposed Project (2026)</td>
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## Flow Inputs

<table>
<thead>
<tr>
<th></th>
<th>Composition</th>
<th>Value</th>
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<tr>
<td>Volume, V</td>
<td>veh/h</td>
<td>8366</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%</td>
<td></td>
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</tbody>
</table>

## Calculate Flow Adjustments

<table>
<thead>
<tr>
<th></th>
<th>Equation</th>
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</thead>
<tbody>
<tr>
<td>$f_p$</td>
<td>1.00</td>
</tr>
<tr>
<td>$E_T$</td>
<td>1.5</td>
</tr>
<tr>
<td>$E_R$</td>
<td>1.2</td>
</tr>
</tbody>
</table>

## Speed Inputs

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
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## LOS and Performance Measures

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td></td>
</tr>
<tr>
<td>$v_p = (V or DDHV) / (PHF x N x f_{HV})$</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>$S$</td>
<td>55.3 mph</td>
</tr>
<tr>
<td>$D = v_p / S$</td>
<td>40.2 pc/mi/ln</td>
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<tr>
<td>LOS</td>
<td>$E$</td>
</tr>
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## Design (N)

<p>| | |</p>
<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Design LOS</td>
<td></td>
</tr>
<tr>
<td>$v_p = (V or DDHV) / (PHF x N x f_{HV})$</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>$S$</td>
<td>mph</td>
</tr>
<tr>
<td>$D = v_p / S$</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>Required Number of Lanes, N</td>
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</table>

## Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>$v_p$</td>
<td>Flow rate</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
</tr>
<tr>
<td>DDHV</td>
<td>Directional design hour volume</td>
</tr>
<tr>
<td>S</td>
<td>Speed</td>
</tr>
<tr>
<td>D</td>
<td>Density</td>
</tr>
<tr>
<td>BFFS</td>
<td>Base free-flow speed</td>
</tr>
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</table>

## Factor Location

<table>
<thead>
<tr>
<th>Factor</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>$E_R$</td>
<td>Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>$f_{LV}$</td>
<td>Exhibit 11-8</td>
</tr>
<tr>
<td>$E_T$</td>
<td>Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>$f_{LC}$</td>
<td>Exhibit 11-9</td>
</tr>
<tr>
<td>$f_p$</td>
<td>Page 11-18</td>
</tr>
<tr>
<td>TRD</td>
<td>Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, $v_p$</td>
<td>Exhibits 11-2, 11-3</td>
</tr>
</tbody>
</table>
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel:** SR-47 Northbound
- **From/To:** at Cdre. Schuyler Heim Bridge
- **Jurisdiction:** CALTRANS
- **Analysis Year:** Proposed Project (2026)

#### Oper.(LOS) | Des.(N) | Planning Data
--- | --- | ---

#### Flow Inputs
- **Volume, V:** 2604 veh/h
- **AADT:** 1.00 veh/day
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, P_T:** 0
- **%RVs, P_R:** 0
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:**

#### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_R:** 1.2
- **E_T:** 1.5
- **f_HV = 1/(1 + P_T(E_R - 1) + P_R(E_T - 1))] 1.000**

#### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 3
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed:** mph

#### Calc Speed Adj and FFS
- **f_LW:** mph
- **f_RC:** mph
- **TRD Adjustment:** mph
- **FFS:** 55.0 mph

#### LOS and Performance Measures
- **Operational (LOS):**
  - \( v_p = (V \times DDHV) / (PHF \times N \times f_{hv}) \) pc/h/ln
- **Base free-flow speed:** mph
- **D = v_p / S:** pc/mi/ln
- **LOS:** B

#### Design (N)
- **Design LOS:**
  - \( v_p = (V \times DDHV) / (PHF \times N \times f_{hv}) \) pc/h/ln
- **D = v_p / S:** pc/mi/ln
- **LOS, S, FFS, v_p:** - Exhibits 11-2, 11-3

### Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **v_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

### Factor Location
- **E_R:** Exhibits 11-10, 11-12
- **f_LW:** Exhibit 11-8
- **E_T:** Exhibits 11-10, 11-11, 11-13
- **f_RC:** Exhibit 11-9
- **f_p:** Page 11-18
- **LOS, S:** FFS, v_p: Exhibits 11-2, 11-3

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BASIC FREEWAY SEGMENTS WORKSHEET

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<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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<table>
<thead>
<tr>
<th>Flow Inputs</th>
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<tbody>
<tr>
<td>Volume, V 3445 veh/h</td>
</tr>
<tr>
<td>AADT 3445 veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K 0.94</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D 0.94</td>
</tr>
<tr>
<td>DDHV = AADT x K x D 3445 veh/h</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Calculate Flow Adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_p 1.00</td>
</tr>
<tr>
<td>E_T 1.5</td>
</tr>
<tr>
<td>f_HV = 1/(1 + P_T * (E_T - 1) + P_R * (E_R - 1)) 1.000</td>
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<table>
<thead>
<tr>
<th>Speed Inputs</th>
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<tbody>
<tr>
<td>Lane Width ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance ft</td>
</tr>
<tr>
<td>Number of Lanes, N 3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD ramps/mi</td>
</tr>
<tr>
<td>FFS (measured) 55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS mph</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOS and Performance Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS) f_p = (V or DDHV) / (PHF x N x f_HV 1222 pc/h/ln x f_p)</td>
</tr>
<tr>
<td>S 55.0 mph</td>
</tr>
<tr>
<td>D = v_p / S 22.2 pc/mi/ln</td>
</tr>
<tr>
<td>LOS C</td>
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<table>
<thead>
<tr>
<th>Speed Inputs</th>
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</thead>
<tbody>
<tr>
<td>Lane Width ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance ft</td>
</tr>
<tr>
<td>Number of Lanes, N 3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD ramps/mi</td>
</tr>
<tr>
<td>FFS (measured) 55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS mph</td>
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</table>

<table>
<thead>
<tr>
<th>Glossary</th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
</tr>
<tr>
<td>V - Hourly volume</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
</tr>
<tr>
<td>LOS - Level of service</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>E_R - Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>f_LW - Exhibit 11-8</td>
</tr>
<tr>
<td>E_T - Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>f_LC - Exhibit 11-9</td>
</tr>
<tr>
<td>f_p - Page 11-18</td>
</tr>
<tr>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
</tr>
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</table>

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# BASIC FREEWAY WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

## Site Information
- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

## Project Description
- YTI Project - Port of Los Angeles

### Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Volume, V</td>
<td>3526 veh/h</td>
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<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>Grade</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments

- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_HV = 1/[(1+P_T)(E_R - 1) + P_R(E_R - 1)]**: 1.00

## Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>2</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

### Operational (LOS)

- **v_p = (V or DDHV) / (PHF x N x f_HV)**
- **S**
- **D = v_p / S**

### Design (N)

- **v_p = (V or DDHV) / (PHF x N x f_HV)**
- **S**
- **D = v_p / S**

## Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **Los**: Level of service
- **DDHV**: Directional design hour volume

## Factor Location

- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: SR-47/Eastbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

## Site Information
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade % Length mi Up/Down %**:

## Flow Inputs
- **Volume, V**: 3416 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: 
- **Peak-Hr Direction Prop, D**: 
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **f_{HV} = 1 + P_T(E_T - 1) + P_R(E_R - 1)**: 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

## Glossary
- N - Number of lanes
- V - Hourly volume
- V_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

## Factor Location
- E_R - Exhibits 11-10, 11-12
- f_{LV} - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_{LC} - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | SR-91/Westbound |
| From/To | East of Alameda St & Santa Fe |
| Jurisdiction | CALTRANS |
| Analysis Year | Proposed Project (2026) |

## Flow Inputs

| Volume, V | 10121 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

\[
f_p = 1.00 \\
E_T = 1.5 \\
E_R = 1.2 \\
f_{HV} = \frac{1}{f_p} + \frac{E_T}{1+P_T} \cdot \frac{E_R}{1+P_R} = 1.000
\]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 6 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## LOS and Performance Measures

| Design (N) |
| Operational (LOS) |
| \[ v_p = \frac{(V \text{ or DDHV}) \times f_{HV}}{(PHF \times N \times f_p) \times S} \] |
| \[ D = \frac{v_p}{S} \] |
| LOS |

## Glossary

- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: SR-91/Eastbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

#### Oper.(LOS) Des.(N) Planning Data

### Flow Inputs
- **Volume, V**: 8037 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: 0
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: 8037 veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_hV = 1/[f [1 + P_T (E_T - 1) + P_R (E_R - 1)]**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 6
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Calc Speed Adj and FFS
- **Calc Speed Adj and FFS**

### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

#### Design LOS
- **Design LOS**

### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **V_p** - Flow rate
- **FFS** - Free-flow speed
- **LOS** - Level of service
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-110/Northbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

## Flow Inputs
- **Volume, V**: 5241 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**:%
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade % Length mi**
- **Up/Down %**

## Calculate Flow Adjustments
- \( f_p \) = 1.00
- \( E_T \) = 1.5
- \( f_{HV} = \frac{1}{1+(P_T)(E_T - 1) + P_R(E_R - 1)} \) = 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## Calc Speed Adj and FFS
- **Calculation**
  - \( f_{LW} \)
  - \( f_{LC} \)
  - TRD Adjustment mph
  - **FFS**: 65.0 mph

## LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f HV \times f_p)} \)
  - \( S \)
  - \( D = \frac{v_p}{S} \)
  - **LOS**
  - \( C \)

## Design (N)
- **Design LOS**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f HV \times f_p)} \)
  - **pc/h/ln**
  - **mph**
  - **pc/mi/ln**
  - Required Number of Lanes, N

## Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_{LW} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information

- **Highway/Direction of Travel**: I-110/Southbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

#### Flow Inputs

| Volume, V | 5156 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT | veh/day | %Trucks and Buses, P_T | 0 |
| Peak-Hr Prop. of AADT, K | | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D | | General Terrain: Level |
| DDHV = AADT x K x D | veh/h | Grade | % | Length | mi |
| | | Up/Down | % |

#### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + (P_T - 1) + P_R (E_T - 1)} \cdot 1.000 \)

#### Speed Inputs

| Lane Width | ft |
| RT-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

#### LOS and Performance Measures

| Operational (LOS) | Design (N) |
| \( v_p = \frac{(V \text{ or DDHV}) \cdot \text{PHF} \cdot N \cdot f_{HV}}{f_p} \) | \( v_p = \frac{(V \text{ or DDHV}) \cdot \text{PHF} \cdot N \cdot f_{HV}}{f_p} \) |
| \( S \) | \( S \) |
| \( D = \frac{v_p}{S} \) | \( D = \frac{v_p}{S} \) |
| LOS | Required Number of Lanes, N |

#### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **\( v_p \)**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

#### Factor Location

- \( E_R \): Exhibits 11-10, 11-12
- \( f_{LV} \): Exhibit 11-8
- \( E_T \): Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \): Exhibit 11-9
- \( f_p \): Page 11-18
- \( TRD \): Page 11-11
- \( LOS, S, FFS, v_p \): Exhibits 11-2, 11-3

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
</tbody>
</table>

#### Site Information

| Highway/Direction of Travel | I-405/Northbound |
| From/To                      | at Santa Fe Av   |
| Jurisdiction                 | CALTRANS         |

#### Project Description

YTI Project - Port of Los Angeles

☑ Oper.(LOS)  ☐ Des.(N)  ☐ Planning Data

#### Flow Inputs

| Volume, V | 9934 | veh/h |
| AADT      | veh/day |
| Peak-Hr Prop. of AADT, K | %RVs, P_R |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | veh/h |

#### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{hv} = \frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)} \times 1.000 \)

#### Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 | mph |
| Base free-flow Speed, BFFS | mph |

#### Speed Adj and FFS

| Lane Width |
| mph |
| \( f_{lw} \) |
| \( f_{lc} \) |
| TRD Adjustment |
| mph |

#### LOS and Performance Measures

| Operational (LOS) |
| S |
| D |
| LOS |

#### Design (N)

| Design LOS |
| pc/h/ln |
| mph |
| pc/mi/ln |

#### Glossary

- N - Number of lanes
- S - Speed
- \( V \) - Hourly volume
- \( D \) - Density
- \( \nu_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

#### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{lw} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{lc} \) - Exhibit 11-9
- \( f_T \) - Page 11-18
- LOS, S, FFS, \( \nu_p \) - Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-405/Southbound
- **From/To**: at Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

### Flow Inputs
- **Volume, V**: 13025 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade % Length mi**:
  - **Up/Down %**:

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)} \cdot 1.00 \)

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)\( v_p = \frac{(V + DDHV) \times (PHF \times N \times f_{HV})}{S} = 2771 \) pc/h/ln
- **D = \frac{v_p}{S} = 72.3 pc/mi/ln
- **LOS**: F

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **S**: Speed
- **D**: Density
- **f_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

### Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_{HV} - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_{LC} - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst** RA
- **Agency or Company** Raju Associates
- **Date Performed** 8/6/2013
- **Analysis Time Period** PM Peak Hour

### Site Information
- **Highway/Direction of Travel** I-710/Northbound
- **From/To** at Alondra Bl
- **Jurisdiction** CALTRANS
- **Analysis Year** Proposed Project (2026)
- **Project Description** YTI Project - Port of Los Angeles

### Flow Inputs
- **Volume, V** 9042 veh/h
- **AADT** veh/day
- **Peak-Hr Prop. of AADT, K**
- **Peak-Hr Direction Prop, D**
- **DDHV = AADT x K x D** veh/h

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \)

### Speed Inputs
- **Lane Width** ft
- **Rt-Side Lat. Clearance** ft
- **Number of Lanes, N** 5
- **Total Ramp Density, TRD** ramps/mi
- **FFS (measured)** 65.0 mph
- **Base free-flow Speed, BFFS** mph

### LOS and Performance Measures
- **Operational (LOS)**
  \[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} x f_p)} \]
  \[ S = \frac{v_p}{D} \]
- **Design (N)**
  \[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} x f_p)} \]
  \[ S = \frac{v_p}{D} \]

### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **f_p** - Flow rate
- **FFS** - Free-flow speed
- **LOS** - Level of service
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_{HV} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: at Alondra Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

### Site Information

- **Peak-Hour Factor, PHF**: 0.94
- **% Trucks and Buses, P_T**: 0
- **% RVs, P_R**: 0
- **General Terrain**: Level
- **Grade %**:
- **Length mi**:
- **Up/Down %**:

### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>7880 veh/h</th>
<th>Peak-Hr Prop. of AADT, K</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td>veh/day</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
<td></td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))**: 1.00

### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p ) = (V or DDHV) / (PHF x N x f_{HV}) x f_p</td>
<td>( v_p ) = (V or DDHV) / (PHF x N x f_{HV}) x f_p</td>
</tr>
<tr>
<td>x f_p</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>63.9 mph</td>
</tr>
<tr>
<td>D</td>
<td>26.2 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>D</td>
</tr>
</tbody>
</table>

### Glossary

- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **f_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **LOS**: Level of Service
- **DDHV**: Directional design hour volume

### Factor Location

<table>
<thead>
<tr>
<th>E_R</th>
<th>Exhibits 11-10, 11-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_{LV}</td>
<td>Exhibit 11-8</td>
</tr>
<tr>
<td>E_T</td>
<td>Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>f_{LC}</td>
<td>Exhibit 11-9</td>
</tr>
<tr>
<td>f_p</td>
<td>Page 11-18</td>
</tr>
<tr>
<td>TRD</td>
<td>Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, ( v_p )</td>
<td>Exhibits 11-2, 11-3</td>
</tr>
</tbody>
</table>
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour

### Site Information
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** Between I-405 & Del Amo
- **Jurisdiction:** CALTRANS
- **Analysis Year:** Proposed Project (2026)

### Project Description
- **YTI Project - Port of Los Angeles**

### Flow Inputs
- **Volume, V:** 8458 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_T:** 1.5
- **E_R:** 1.2

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:** mph

### LOS and Performance Measures
- **Operational (LOS):**
  - **S:** 50.0 mph
  - **D = v_p / S:** 45.0 pc/mi/ln
  - **LOS:**

### Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **v_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

### Factor Location
- **E_R:** Exhibits 11-10, 11-12
- **f_LW:** Exhibit 11-8
- **E_T:** Exhibits 11-10, 11-11, 11-13
- **f_LC:** Exhibit 11-9
- **f_p:** Page 11-18
- **LOS:** Page 11-18
- **S, FFS, v_p:** Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

## Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between I-405 & Del Amo Blvd
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

## Project Description
- **YTI Project - Port of Los Angeles**

## Flow Inputs
<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (veh/h)</td>
<td>7126</td>
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<tr>
<td>AADT (veh/day)</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \)
  
## Speed Inputs
- **Lane Width** (ft)
- **Rt-Side Lat. Clearance** (ft)
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD** (ramps/mi)
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

## Loss and Performance Measures
- **Operational (LOS)**
  - \( V_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}} \times f_p) \equiv 1895 \text{ pc/h/ln} \)
  - \( S = 54.8 \text{ mph} \)
  - \( D = \frac{V_p}{S} = 34.6 \text{ pc/mi/ln} \)

## Design (N)
- **Design LOS**
  - \( V_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}} \times f_p) \equiv \text{ pc/h/ln} \)
  - \( S = \text{ mph} \)
  - \( D = \frac{V_p}{S} = \text{ pc/mi/ln} \)
  - **Required Number of Lanes, N**

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

---

### Factor Location
- \( E_R \): Exhibits 11-10, 11-12
- \( f_{LV} \): Exhibit 11-8
- \( E_T \): Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \): Exhibit 11-9
- \( f_p \): Page 11-18
- **TRD**: Page 11-11

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**HCS 2010™ Version 6.50**

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**BASIC FREEWAY SEGMENTS WORKSHEET**

<table>
<thead>
<tr>
<th><strong>General Information</strong></th>
<th><strong>Site Information</strong></th>
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<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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<tr>
<td>Highway/Direction of Travel</td>
<td>I-710/Northbound</td>
</tr>
<tr>
<td>From/To</td>
<td>Between PCH &amp; Willow St</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>Proposed Project (2026)</td>
</tr>
</tbody>
</table>

**Flow Inputs**

- **Volume, V**: 6274 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: 
- **Peak-Hr Direction Prop, D**: 
- **DDHV = AADT x K x D**: veh/h

**Calculate Flow Adjustments**

- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = 1/(1+P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

**Speed Inputs**

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

**LOS and Performance Measures**

**Operational (LOS)**

- **v_p = (V or DDHV) / (PHF x N x f_{HV})**
- **S**: 50.5 mph
- **D = v_p / S**: 44.0 pc/mi/ln
- **LOS**: E

**Design (N)**

- **Design LOS**
- **v_p = (V or DDHV) / (PHF x N x f_{HV})**
- **S**: mph
- **D = v_p / S**: pc/mi/ln
- **Required Number of Lanes, N**

**Glossary**

- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **FFS**: Free-flow speed

**Factor Location**

- **E_R - Exhibits 11-10, 11-12**
- **f_{LV} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
## BASIC FREEWAY WORKSHEET

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### Site Information

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<td>Proposed Project (2026)</td>
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### Flow Inputs

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<th>Volume, V (veh/h)</th>
<th>AADT (veh/day)</th>
<th>Peak-Hr Prop. of AADT, K</th>
<th>Peak-Hr Direction Prop, D</th>
<th>DDHV = AADT x K x D (veh/h)</th>
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### Calculate Flow Adjustments

- $f_p$ = 1.00
- $E_T$ = 1.5
- $E_R$ = 1.2
- $f_{HV} = \frac{1}{(1+P_T f_L)} + P_R (E_R - 1)$ = 1.00

### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width (ft)</th>
<th>RT-Side Lat. Clearance (ft)</th>
<th>Number of Lanes, N</th>
<th>Total Ramp Density, TRD (ramps/mi)</th>
<th>FFS (measured) (mph)</th>
<th>Base free-flow Speed, BFFS (mph)</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>3</td>
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### Speed Adj and FFS

<table>
<thead>
<tr>
<th>$f_{LV}$</th>
<th>$f_{LC}$</th>
<th>TRD Adjustment</th>
<th>FFS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td>55.0</td>
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### LOS and Performance Measures

<table>
<thead>
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<th>Operational (LOS)</th>
<th>Design (N)</th>
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<tr>
<td>$v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV}}$</td>
<td>$v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV}}$</td>
</tr>
<tr>
<td>S = 50.2 mph</td>
<td>S = 50.2 mph</td>
</tr>
<tr>
<td>D = $v_p / S$</td>
<td>D = $v_p / S$</td>
</tr>
<tr>
<td>LOS E</td>
<td>Required Number of Lanes, N</td>
</tr>
</tbody>
</table>

### Glossary

- N - Number of lanes
- V - Hourly volume
- $v_p$ - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed
- PHF - Peak-Hour Factor
- $P_T$ - % Trucks and Buses
- $P_R$ - % RVs
- $f_{HV}$ - Flow adjustment factor
- $f_L$ - Lane length adjustment factor
- $E_R$ - Exhibit level
- $E_T$ - Exhibit level
- $f_{LV}$ - Lane width adjustment factor
- $f_{LC}$ - Lane clearance adjustment factor

### Factor Location

- $E_R$ - Exhibits 11-10, 11-12
- $f_{LV}$ - Exhibit 11-8
- $E_T$ - Exhibits 11-10, 11-11, 11-13
- $f_{LC}$ - Exhibit 11-9
- $f_p$ - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyser**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

#### Flow Inputs
- **Volume, V**: 7515 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **% Trucks and Buses, P_T**: 0
- **% RVs, P_R**: 0
- **General Terrain**: Level
- **Grade %**:
- **Length mi**:
- **Up/Down %**:

#### Calculate Flow Adjustments
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \)
- \( f_R = 1.00 \)

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV) \times PHF \times N \times f_{HV}}{f_p} \times f_p \)
  - \( S \)
  - \( D = \frac{v_p}{S} \)
  - **LOS**: D

- **Design (N)**
  - Design LOS
  - Design (N)
  - **v_p = \frac{(V \text{ or } DDHV) \times PHF \times N \times f_{HV}}{f_p} \times f_p \)**
  - **S**: mph
  - **D = \frac{v_p}{S} (** pc/mi
  - **Required Number of Lanes, N**

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

---

**Calc Speed Adj and FFS**
- \( f_{LV} \)
- \( f_{LC} \)
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

**Factor Location**
- \( E_R - \text{Exhibits 11-10, 11-12} \)
- \( f_{LV} - \text{Exhibit 11-8} \)
- \( E_T - \text{Exhibits 11-10, 11-11, 11-13} \)
- \( f_{LC} - \text{Exhibit 11-9} \)
- \( f_p - \text{Page 11-18} \)
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

---

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

### Site Information
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade**: %
- **Length**: mi
- **Up/Down %**

### Flow Inputs
- **Volume, V**: 8734 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments

| f_p | 1.00 | E_R | 1.2 |
| E_T | 1.5 | f_HV = 1/(1+P_T(E_T - 1) + P_R(E_R - 1)] 1.00 |

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS

| f_LW | mph |
| f_LC | mph |

### LOS and Performance Measures
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph
- **Required Number of Lanes, N**

### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Design (N)

| Design (N) |
| Design LOS |
| v_p = (V or DDHV) / (PHF x N x f_HV) |
| pc/h/ln |
| S |
| mph |
| D = v_p / S |
| pc/mi/ln |

### Glossary

| N: Number of lanes | S: Speed | E_R: Exhibits 11-10, 11-12 | f_LW: Exhibit 11-8 |
| V: Hourly volume | D: Density | E_T: Exhibits 11-10, 11-11, 11-13 | f_LC: Exhibit 11-9 |
| LOS, S, FFS, v_p: Exhibits 11-2, 11-3 | BFFS: Base free-flow speed |

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyzer: RA
Agency or Company: Raju Associates
Date Performed: 8/6/2013
Analysis Time Period: PM Peak Hour

Project Description: YTI Project - Port of Los Angeles

Site Information

Highway/Direction of Travel: I-710/Northbound
From/To: n/o I-105 and n/o Firestone
Jurisdiction: CALTRANS
Analysis Year: Proposed Project (2026)

Flow Inputs

Volume, V: 8230 veh/h
AADT: veh/day
Peak-Hr Prop. of AADT, K:
Peak-Hr Direction Prop, D:
DDHV = AADT x K x D: veh/h

Calculate Flow Adjustments

f_p: 1.00
E_T: 1.5

Speed Inputs

Lane Width: ft
Rt-Side Lat. Clearance: ft
Number of Lanes, N: 4
Total Ramp Density, TRD: ramps/mi
FFS (measured): 65.0 mph
Base free-flow Speed: mph

Calc Speed Adj and FFS

f_LW: mph
f_LC: mph
TRD Adjustment: mph
FFS: 65.0 mph

LOS and Performance Measures

Operational (LOS): v_p = (V or DDHV) / (PHF x N x f_r)
x f_p: pc/h/ln
S: 56.2 mph
D = v_p / S: pc/mi/ln
LOS: E

Design (N): Design LOS

Design LOS:

v_p = (V or DDHV) / (PHF x N x f_r): pc/h/ln
S: mph
D = v_p / S: pc/mi/ln

Glossary

E_R - Exhibits 11-10, 11-12
f_LW - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13
f_LC - Exhibit 11-9
f_p - Page 11-18
TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3

Factor Location

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume

Factor Location

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: n/o I-105 & n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

#### Flow Inputs
- **Volume, V**: 9042 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV**: \( \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \)

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)** pc/h/ln
  - **S**: 50.7 mph
  - **D = v_p / S**: 47.5 pc/mi/ln
- **LOS**: F

#### Design (N)
- **Design LOS**: pc/h/ln
- **Design (N)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)** pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **Required Number of Lanes, N**

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **f_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

---

**Factor Location**
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: SR-47/Northbound
- **From/To**: at Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

### Site Information
- **Project Description**: YTI Project - Port of Los Angeles
- **Oper.(LOS)**
- **Des.(N)**
- **Planning Data**

### Flow Inputs
- **Volume, V**: 2304 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade %**:
- **Length mi**:
- **Up/Down %**:

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **f_T**: 1.5
- **f_HV = \frac{1}{f_p[1+E_R(T-1)] + P_R(E_R-1)}**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

### LOS and Performance Measures
- **Design (N)**
- **Design LOS**
- **Design (N)**

### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **V_p - Flow rate**
- **FFS - Free-flow speed**
- **LOS - Level of service**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
## BASIC FREEWAY SEGMENTS WORKSHEET

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<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
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</table>

### General Information
- **Highway/Direction of Travel**: SR-47/Southbound
- **From/To**: at Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Proposed Project (2026)**

### Project Description
- **YTI Project - Port of Los Angeles**
- **Oper.(LOS)**
- **Des.(N)**
- **Planning Data**

### Flow Inputs
- **Volume, V**: 1945 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade %**:
- **Length, mi**:
- **Up/Down %**:

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_HV = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume
- **FFS** - Free-flow speed
- **BFFS** - Base free-flow speed

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information

- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

### Flow Inputs

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<tr>
<th>Volume, V</th>
<th>AADT</th>
<th>Peak-Hr Prop. of AADT, K</th>
<th>Peak-Hr Direction Prop, D</th>
<th>DDHV = AADT x K x D</th>
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</thead>
<tbody>
<tr>
<td>3411 veh/h</td>
<td>veh/day</td>
<td>% RVs, P&lt;sub&gt;R&lt;/sub&gt;</td>
<td>General Terrain: Level</td>
<td></td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- **f<sub>p</sub>**: 1.00
- **E<sub>R</sub>**: 1.2
- **E<sub>T</sub>**: 1.5
- **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

### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
<th>f&lt;sub&gt;LW&lt;/sub&gt;</th>
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</thead>
<tbody>
<tr>
<td>55.0 mph</td>
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<td></td>
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</table>

### LOS and Performance Measures

- **Operational (LOS)**
- **Design (N)**

### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **V<sub>p</sub>**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **E<sub>R</sub>**: Exhibits 11-10, 11-12
- **f<sub>LW</sub>**: Exhibit 11-8
- **E<sub>T</sub>**: Exhibits 11-10, 11-11, 11-13
- **f<sub>LC</sub>**: Exhibit 11-9
- **D**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, V<sub>p</sub>**: Exhibits 11-2, 11-3

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3/19/2014
**BASIC FREEWAY SEGMENTS WORKSHEET**

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<th>Site Information</th>
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<tbody>
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<td>RA</td>
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<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
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<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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<tr>
<td>Highway/Direction of Travel</td>
<td>SR-47/Eastbound</td>
</tr>
<tr>
<td>From/To</td>
<td>at Vincent Thomas Bridge</td>
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<td>Jurisdiction</td>
<td>CALTRANS</td>
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<td>Analysis Year</td>
<td>Proposed Project (2026)</td>
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<td>Oper.(LOS)</td>
<td>Des.(N)</td>
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<td>Planning Data</td>
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**Flow Inputs**

- **Volume, V**: 4237 veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **AADT**: veh/day
- **%Trucks and Buses, P_T**: 0
- **Peak-Hr Prop. of AADT, K**: %RVs, P_R 0
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D veh/h**
- **Grade % Length mi**
- **Up/Down %**

**Calculate Flow Adjustments**

- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = 1/(1+P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

**Speed Inputs**

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD ramps/mi**
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS mph**

**Calc Speed Adj and FFS**

- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: mph

**LOS and Performance Measures**

- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV})} \times f_p \)
  - \( S \) = 49.9 mph
  - \( D = \frac{v_p}{S} \)
  - \( D = \frac{v_p}{S} \) pc/h/ln
  - **LOS**

**Design (N)**

- **Design LOS**
  - \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV})} \times f_p \)
  - **S** = mph
  - **D = v_p / S** pc/h/ln

**Glossary**

- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **v_p - Flow rate**
- **FFS - Free-flow speed**
- **LOS - Level of service**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**

<table>
<thead>
<tr>
<th>Glossary</th>
<th>Factor Location</th>
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<tr>
<td>N - Number of lanes</td>
<td><strong>E_R</strong> - Exhibits 11-10, 11-12</td>
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<tr>
<td>V - Hourly volume</td>
<td><strong>f_{HV}</strong> - Exhibit 11-8</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td><strong>E_T</strong> - Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td><strong>f_p</strong> - Page 11-18</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td><strong>TRD</strong> - Page 11-11</td>
</tr>
</tbody>
</table>

**Factor Location**

- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel:** SR-91/Westbound
- **From/To:** East of Alameda St & Santa Fe
- **Jurisdiction:** CALTRANS
- **Analysis Year:** Proposed Project (2026)

## Flow Inputs
- **Volume, V:** 9358 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **DDHV = AADT x K x D:** veh/h
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, P_T:** 0
- **%RVs, P_R:** 0
- **General Terrain:** Level
- **Grade:** %
- **Length:** mi
- **Up/Down %**

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_R:** 1.2
- **E_T:** 1.5
- **f_{HV} = 1/(1+P_T(E_R-1) + P_R(E_R-1)):** 1.000

## Flow Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 6 ramps/mi
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

### Speed Inputs
- **f_{LW}:** mph
- **f_{LC}:** mph

### LOS and Performance Measures
- **Operational (LOS):**
  - \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV})} \)
  - \( S = 64.0 \text{ mph} \)
  - \( D = v_p / S \)
  - **LOS:**

### Design (N)
- **Design LOS:**
  - \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV})} \)
  - \( S = \text{ mph} \)
  - \( D = v_p / S \)
  - **Required Number of Lanes, N**

### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **\( v_p \) - Flow rate**
- **FFS - Free-flow speed**
- **LOS - Level of service**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**

---

**Factor Location**

- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3**

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

### Site Information
- **Highway/Direction of Travel**: SR-91/Eastbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Proposed Project (2026)

### Project Description
- **YTI Project - Port of Los Angeles**

### Flow Inputs
- **Volume, V**: 7271 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_r**: 1.2
- **E_t**: 1.5
- **f_HV = 1/1 + P_T(E_T - 1) + P_R(E_R - 1)**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 6
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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NO PROJECT ALTERNATIVE (2026) – ALTERNATIVE 1

AM/PM PEAK HOURS
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<th>Analyst</th>
<th>RA</th>
</tr>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | n/o I-105 and n/o Firestone |
| Jurisdiction | CALTRANS |
| Analysis Year | No Project Alternative (2026) |

## Flow Inputs

| Volume, V | 8949 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | |
| Peak-Hr Direction Prop, D | veh/h |
| DDHV = AADT x K x D | |

## Calculate Flow Adjustments

| \( f_p \) | 1.00 |
| \( E_T \) | 1.5 |

### Formula

\[
f_{HV} = \frac{1}{f_p^{[1+P_T(E_T-1)] + P_R(E_R-1)]} \times 1.000
\]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## LOS and Performance Measures

### Operational (LOS)

| \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \times 2380 \text{ pc/h/ln} | S | 51.4 mph |
| D = \frac{v_p}{S} | 46.3 pc/mi/ln |
| LOS | F |

### Design (N)

| Design LOS
| Design (N) |
| \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}} \times f_p)} \text{ pc/h/ln} |
| S | mph |
| D = \frac{v_p}{S} | pc/mi/ln |
| Required Number of Lanes, N | |

### Glossary

- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( V_p \) - Flow rate
- \( LOS \) - Level of service
- \( DDHV \) - Directional design hour volume
- \( S \) - Speed
- \( D \) - Density
- \( f_p \) - Page 11-18
- \( f_{HV} \) - Exhibit 11-10, 11-12
- \( f_{LC} \) - Exhibit 11-9
- \( f_{FW} \) - Exhibit 11-8
- \( f_{LV} \) - Exhibit 11-8
- TRD - Page 11-11

## Factor Location

| E_R - Exhibits 11-10, 11-12 | f_{FW} - Exhibit 11-8 |
| E_p - Exhibits 11-10, 11-11, 11-13 | f_{LV} - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 | |

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: AM Peak Hour

#### Site Information
- Highway/Direction of Travel: I-710/Southbound
- From/To: n/o I-105 & n/o Firestone
- Jurisdiction: CALTRANS
- Analysis Year: (2026)
- Project Description: YTI Project - Port of Los Angeles

#### Flow Inputs
- **Volume, V**: 8261 veh/h
- **AADT**: veh/day
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **Peak-Hr Prop. of AADT, K**:
- **Peak-Hr Direction Prop, D**:
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- \( f_p \)
- \( E_T \)
- \( f_{HV} = \frac{1}{f_p (E_T - 1) + P_R (E_R - 1)} \)

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**
- \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV} \times f_p)} \)
- \( S \)
- \( D = \frac{v_p}{S} \)
- **LOS**

#### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **LOS** - Level of service
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume

#### Design (N)
- **Design LOS**
- \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV} \times f_p)} \)
- \( S \)
- \( D = \frac{v_p}{S} \)
- **Required Number of Lanes, N**

#### Factor Location
- **E_R** - Exhibits 11-10, 11-12
- **f_{LVW}** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-110/Northbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: (2026)

### Flow Inputs
- **Volume, V**: 4643 veh/h
- **AADT**: ve/h/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h

**Calculate Flow Adjustments**
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV**: \( \frac{1}{f_p [1 + P_T (E_T - 1) + P_R (E_R - 1)]} \) 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

**Calc Speed Adj and FFS**
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_p)} \)
  - \( S \) = 65.0 mph
  - \( D = v_p / S \)
  - \( 19.0 \) pc/mi/ln

**Design (N)**
- **Required Number of Lanes, N**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
BASIC FREEWAY SEGMENTS WORKSHEET

General Information

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<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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Site Information

| Highway/Direction of Travel | I-110/Southbound |
| From/To | South of C St |
| Jurisdiction | CALTRANS |
| Analysis Year | No Project Alternative (2026) |

Project Description

YTI Project - Port of Los Angeles

Oper.(LOS) Des.(N) Planning Data

Flow Inputs

| Volume, V | 3317 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T | 0.94 |
| Peak-Hr Direction Prop, D | %RVs, P_R | 0 |
| DDHV = AADT x K x D | veh/h |

Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ f_{HV} = \frac{1}{f_p^{[1 + P_T(E_T - 1)] + P_R(E_R - 1)]} = 1.000 \]

Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/ni |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

Calc Speed Adj and FFS

| f_LW | mph |
| f_LC | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

LOS and Performance Measures

| \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p) \) | 882 pc/h/ln |
| S | 65.0 mph |
| D = \( v_p / S \) | 13.6 pc/mi/ln |
| LOS | B |

Design (N)

Design LOS

| \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p) \) | pc/h/ln |
| S | mph |
| D = \( v_p / S \) | pc/mi/ln |
| Required Number of Lanes, N |

Glossary

| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| \( v_p \) - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume |

Factor Location

| E_R - Exhibits 11-10, 11-12 | f_{LV} - Exhibit 11-8 |
| E_T - Exhibits 11-10, 11-11, 11-13 | f_{LC} - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3 |
### General Information

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<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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### Site Information

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<th>Highway/Direction of Travel</th>
<th>I-405/Northbound</th>
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<tr>
<td>From/To</td>
<td>At Santa Fe Av</td>
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<td>Analysis Year</td>
<td>No Project Alternative (2026)</td>
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### Project Description

- YTI Project - Port of Los Angeles

### Flow Inputs

| Volume, V | 11854 veh/h |
| AADT      | veh/day     |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T 0.94 |
| Peak-Hr Direction Prop, D | %RVs, P_R 0 |
| DDHV = AADT x K x D | veh/h |

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( f_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{(1+P_T(E_T-1) + P_R(E_R-1))} \times 1.00 \)

### Speed Inputs

- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 5
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 65.0 mph
- Base free-flow Speed, BFFS: mph

### Calc Speed Adj and FFS

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<th>Lane Width</th>
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<td>RT-Side Lat. Clearance</td>
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<tr>
<td>Number of Lanes, N</td>
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<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
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<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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</tbody>
</table>

### Design (N)

<table>
<thead>
<tr>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS - Level of service</td>
</tr>
<tr>
<td>V - Hourly volume</td>
</tr>
<tr>
<td>V_p - Flow rate</td>
</tr>
<tr>
<td>D - Density</td>
</tr>
</tbody>
</table>

### Glossary

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>V_p - Flow rate</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td>pc/mi/ln</td>
</tr>
</tbody>
</table>

### Factor Location

| E_R - Exhibits 11-10, 11-12 | f_LW - Exhibit 11-8 |
| E_T - Exhibits 11-10, 11-11, 11-13 | f_LC - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 | |

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-405/Southbound
- **From/To**: At Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

### Flow Inputs
- **Volume, V**: 7526 veh/h, Peak-Hour Factor, PHF: 0.94
- **AADT**: veh/day, %Trucks and Buses, P_T: 0
- **Peak-Hr Prop. of AADT, K**: %RVs, P_R: 0
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h, Grade %

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/[1 + P_T(E_T - 1) + P_R(E_R - 1)]**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**: Design (N)
- **Design LOS**: Design (N)

### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume
- **FFS** - Free-flow speed

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_FC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, V_p**: Exhibits 11-2, 11-3

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**General Information**

**Site Information**

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
<th>Highway/Direction of Travel</th>
<th>I-710/Northbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
<td>From/To</td>
<td>At Alondra Bl</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
<td>Analysis Year</td>
<td>No Project Alternative (2026)</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
<td>Oper.(LOS)</td>
<td>No</td>
</tr>
</tbody>
</table>

**Flow Inputs**

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>AADT</th>
<th>Peak-Hour Factor, PHF</th>
<th>%Trucks and Buses, P_T</th>
</tr>
</thead>
<tbody>
<tr>
<td>7676 veh/h</td>
<td>veh/day</td>
<td>0.94</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak-Hr Prop. of AADT, K</th>
<th>%RVs, P_R</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak-Hr Direction Prop, D</th>
<th>General Terrain: Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Up/Down %</td>
</tr>
</tbody>
</table>

**Calculate Flow Adjustments**

<table>
<thead>
<tr>
<th>f_p</th>
<th>E_R</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>1.2</td>
</tr>
</tbody>
</table>

\[ f_{HV} = \frac{1}{f_p(E_R + P_T) + P_R(E_R - 1)} \times 1.000 \]

**Speed Inputs**

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>Rt-Side Lat. Clearance</th>
<th>Number of Lanes, N</th>
<th>Total Ramp Density, TRD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ft</td>
<td>ft</td>
<td>5</td>
<td>ramps/mi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FFS (measured)</th>
<th>Base free-flow Speed, BFFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>65.0 mph</td>
<td></td>
</tr>
</tbody>
</table>

**LOS and Performance Measures**

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>1633 pc/h/ln</td>
<td></td>
</tr>
</tbody>
</table>

\[ S = \frac{64.2}{mph} \]

\[ D = \frac{25.4}{pc/mi/ln} \]

\[ LOS = \frac{C}{C} \]

\[ v_p = \frac{(V or DDHV)}{(PHF x N x f_{HV} x f_p)} \times 1.000 \]

**Glossary**

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service speed</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

\[ E_R - Exhibits 11-10, 11-12 \]

\[ f_{HV} - Exhibit 11-8 \]

\[ f_{LC} - Exhibit 11-9 \]

\[ f_p - Page 11-18 \]

\[ TRD - Page 11-11 \]

\[ LOS, S, FFS, v_p - Exhibits 11-2, 11-3 \]

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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</table>

### Site Information
<table>
<thead>
<tr>
<th>Site Information</th>
<th>Highway/Direction of Travel I-710/Southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>From/To</td>
<td>At Alondra Bl</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>No Project Alternative (2026)</td>
</tr>
</tbody>
</table>

### Flow Inputs

<table>
<thead>
<tr>
<th>Flow Inputs</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>9915 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>veh/h</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>Grade % Length mi</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Formula</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f_p$</td>
<td>1.00</td>
</tr>
<tr>
<td>$E_T$</td>
<td>1.5</td>
</tr>
</tbody>
</table>

### Speed Inputs

<table>
<thead>
<tr>
<th>Speed Inputs</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>LOS and Performance Measures</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td></td>
</tr>
<tr>
<td>$v_p$ = (V or DDHV) / (PHF x N x $f_{hv}$ x $f_p$)</td>
<td>2110 pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>57.9 mph</td>
</tr>
<tr>
<td>D = $v_p$ / S</td>
<td>36.5 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>E</td>
</tr>
</tbody>
</table>

### Design (N)

<table>
<thead>
<tr>
<th>Design (N)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design LOS</td>
<td></td>
</tr>
<tr>
<td>$v_p$ = (V or DDHV) / (PHF x N x $f_{hv}$ x $f_p$)</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>mph</td>
</tr>
<tr>
<td>D = $v_p$ / S</td>
<td>pc/mi/ln</td>
</tr>
</tbody>
</table>

### Glossary

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>$v_p$ - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

### Factor Location

<table>
<thead>
<tr>
<th>Factor Location</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E_R$ - Exhibits 11-10, 11-12</td>
<td>$f_LW$ - Exhibit 11-8</td>
</tr>
<tr>
<td>$E_T$ - Exhibits 11-10, 11-11, 11-13</td>
<td>$f_{LC}$ - Exhibit 11-9</td>
</tr>
<tr>
<td>$f_p$ - Page 11-18</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3</td>
<td></td>
</tr>
</tbody>
</table>

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Peak-Hr Prop. of AADT, K**: 7181 veh/h
- **Peak-Hr Direction Prop, D**: 
- **DDHV = AADT x K x D**: veh/h

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between I-405 & Del Amo Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

### Project Description
- **Project - YTI Project - Port of Los Angeles**

### Flow Inputs
<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>7181</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>7181</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Site Performance Measures
<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Input</td>
<td>Calc Speed Adj and FFS</td>
</tr>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- \( f_{HV} = \frac{1}{[1 + P_T(f_p - 1) + P_R(E_R - 1)]} \times 1.000 \)

### LOS and Performance Measures
- **Operational (LOS)**
  \( v_p = \frac{(V \text{ or } DDHV) \times \text{PHF} \times \text{N} \times f_{RV} \times f_p}{1910} \) pc/h/ln
  \( S = 54.7 \) mph
  \( D = \frac{v_p}{S} \) pc/mi/ln
  \( D = \frac{DS}{S} \) pc/mi/ln
  \( D_{LOS} = D \)

### Design (N)
- **Design (N)**
  \( v_p = \frac{(V \text{ or } DDHV) \times \text{PHF} \times \text{N} \times f_{RV} \times f_p}{1910} \) pc/h/ln
  \( S = \text{mph} \)
  \( D = v_p / S \) pc/mi/ln
  \( D_{LOS} = D \) pc/mi/ln
  \( \text{Required Number of Lanes, N} \)

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **BFFS**: Base free-flow speed

### Factor Location
- **E_R** - Exhibits 11-10, 11-12
- **f_{LVW}** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between I-405 & Del Amo Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

### Flow Inputs
- **Volume, V**: 8097 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **f_HV = 1/[1+P_T(f_T - 1) + P_R(f_R - 1)]**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_{RV} x f_p)**: pc/h/ln
  - **S**: 51.9 mph
  - **D = v_p / S**: 41.5 pc/mi/ln
  - **LOS**: E

### Design (N)
- **Design (N)**
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_{RV} x f_p)**: pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
- **Required Number of Lanes, N**

### Glossary
- **N** - Number of lanes
- **V** - Hourly volume
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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# BASIC FREEWAY WORKSHEET

## General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: AM Peak Hour
- Project Description: YTI Project - Port of Los Angeles

## Site Information
- Highway/Direction of Travel: I-710/Northbound
- From/To: Between PCH & Willow St
- Jurisdiction: CALTRANS
- Analysis Year: No Project Alternative (2026)

## Flow Inputs
- Volume, V: 5998 veh/h
- AADT: 5998 veh/day
- Peak-Hr Prop. of AADT, K: 0
- Peak-Hr Direction Prop, D: 0
- DDDV = AADT x K x D: veh/h

## Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{f_p + E_T(E_T - 1) + E_R(E_R - 1)} \)

## Speed Inputs
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 3
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 55.0 mph
- Base free-flow Speed, BFFS: mph

## Speed Adjustments and FFS
- \( f_{LW} \)
- \( f_{LC} \)

## LOS and Performance Measures
- Operational (LOS): pc/h/ln
- S: 52.4 mph
- D: 40.6 pc/mi/ln
- LOS: E

## Design (N)
- Design LOS: pc/h/ln
- Design (N): pc/mi/ln
- Required Number of Lanes, N

## Glossary
- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- FFS - Free-flow speed
- BFFS - Base free-flow speed
- E_R - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- E_p - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour

## Site Information
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** Between PCH & Willow St
- **Jurisdiction:** CALTRANS
- **Analysis Year:** No Project Alternative (2026)

## Project Description
- **YTI Project - Port of Los Angeles**

## Flow Inputs
- **Volume, V:** 6836 veh/h
- **AADT:** veh/day
- **Peak-Hour Factor, PHF:** 0.94
- **% Trucks and Buses, P_T:** 0
- **% RVs, P_R:** 0
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**

## Calculate Flow Adjustments
- **f_p:** 1.00
- **E_R:** 1.2
- **E_T:** 1.5
- **f_HV = \frac{1}{f_p(E_T - 1) + P_R(E_R - 1)} 1.000**

## Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 3
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:** mph

## LOS and Performance Measures
- **Operational (LOS):**
  - \( S = \frac{V}{P} \)
  - \( D = \frac{V}{S} \)
  - \( LOS = F \)

## Design (N)
- **Design LOS**
  - \( S = \frac{V}{P} \)
  - \( D = \frac{V}{S} \)
  - **Required Number of Lanes, N**

## Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **D:** Density
- **LOS:** Level of service
- **f_p:** Flow rate
- **FFS:** Free-flow speed
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_p - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, V_p - Exhibits 11-2, 11-3**
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: (2026)
- **No Project Alternative**

### Flow Inputs
- **Volume, V**: 8924 veh/h
- **AADT**: veh/day
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **Peak-Hr Prop. of AADT, K**: 
- **Peak-Hr Direction Prop, D**: 
- **DDHV = AADT x K x D**: veh/h
- **Flow Inputs**: 
  - **f_p**: 1.00
  - **E_T**: 1.5
  - **f_HV = 1/[1 + P_T(E_T - 1) + P_R(E_R - 1)]**: 1.000

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/[1 + P_T(E_T - 1) + P_R(E_R - 1)]**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **LOS and Performance Measures**
  - **LOS**: Design (N)
  - **Required Number of Lanes, N**:  

### Design (N)
- **Design (N)**
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_HV x f_p)**
  - **pc/h/ln**
  - **S**: 51.6 mph
  - **D**: 46.0 pc/mi/ln
  - **LOS**: F

### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **v_p - Flow rate**
- **FFS - Free-flow speed**
- **LOS - Level of service**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**

---

**Factor Location**
- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: (2026)

### Site Information
- **No Project Alternative**

### Flow Inputs
- **Volume, V**: 7321 veh/h
- **AADT**: veh/day
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **Peak-Hr Prop. of AADT, K**: 1.2
- **General Terrain**: Level
- **Peak-Hr Direction Prop, D**: 1.5
- **DDHV = AADT x K x D**: veh/h
- **Grade % Length mi**: Up/Down %

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{0.94 + 1.5(E_T - 1) + 1.2(E_R - 1)} \)
- \( 1.000 \)

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Design (N)**
- **Operational (LOS)**
- **Design LOS**
- **LOD**
- **LOS**
- **LOS - Level of service**
- **LOS - Free-flow speed**
- **LOS - Base free-flow speed**
- **LOS - Directional design hour volume**

### Glossary
- **N** - Number of lanes
- **V** - Hourly volume
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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### General Information

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

### Site Information

- **Highway/Direction of Travel**: SR-47 Northbound
- **From/To**: at Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

### Project Description

- **Oper.(LOS)**
- **Des.(N)**
- **Planning Data**

### Flow Inputs

| Volume, V | 581 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_R = 1.2 \)

### Speed Inputs

| Lane Width | ft |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 55.0 mph |
| Base free-flow Speed, BFFS | mph |

### LOS and Performance Measures

| \( v_p = (V or DDHV) / (PHF x N x f_{RV} x f_p) \) | 206 pc/h/ln |
| S | 55.0 mph |
| D = \( v_p / S \) | 3.7 pc/mi/ln |

### Design (N)

- **Design LOS**

### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **f_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

---

**General Information**

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

**Site Information**

- **Highway/Direction of Travel**: SR-47 Northbound
- **From/To**: at Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

**Project Description**

- **Oper.(LOS)**
- **Des.(N)**
- **Planning Data**

**Flow Inputs**

| Volume, V | 581 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

**Calculate Flow Adjustments**

- \( f_p = 1.00 \)
- \( E_R = 1.2 \)

**Speed Inputs**

| Lane Width | ft |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 55.0 mph |
| Base free-flow Speed, BFFS | mph |

**LOS and Performance Measures**

| \( v_p = (V or DDHV) / (PHF x N x f_{RV} x f_p) \) | 206 pc/h/ln |
| S | 55.0 mph |
| D = \( v_p / S \) | 3.7 pc/mi/ln |

**Design (N)**

- **Design LOS**

**Glossary**

- **N**: Number of lanes
- **V**: Hourly volume
- **f_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

#### Site Information
- **Highway/Direction of Travel**: SR-47 Southbound at Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

#### Project Description
- **Oper.(LOS)**

### Flow Inputs

| Volume, V | 963 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT     | veh/day   | %Trucks and Buses, P_T | 0    |
| Peak-Hr Prop. of AADT, K | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D | | |
| DDHV = AADT x K x D | veh/h | Grade | % | Length | mi |

#### Calculate Flow Adjustments

- **f_p**: 1.00
- **E_R**: 1.2
- \( f_{HV} = \frac{1}{(1+P_T(f_T - 1) + P_R(E_R - 1))} \) 1.000

#### Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 3 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 55.0 mph |
| Base free-flow Speed, BFFS | mph |

#### Calc Speed Adj and FFS

| f_LW | mph |
| f_LC | mph |
| TRD Adjustment | mph |
| FFS | 55.0 mph |

#### LOS and Performance Measures

#### Design (N)

- **Design (**N**)**
- **Design LOS**
- **Required Number of Lanes, N**

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

#### Factor Location

- **E_R** - Exhibits 11-10, 11-12
- **f_{LVW}** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, V_p** - Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

**Analyst**: RA  
**Agency or Company**: Raju Associates  
**Date Performed**: 8/6/2013  
**Analysis Time Period**: AM Peak Hour  
**Project Description**: YTI Project - Port of Los Angeles

### Site Information

**Highway/Direction of Travel**: SR-47/Westbound  
**From/To**: at Vincent Thomas Bridge  
**Jurisdiction**: CALTRANS  
**Analysis Year**: (2026)  
**No Project Alternative**

### Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>2259 veh/h</td>
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<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%RVs, P&lt;sub&gt;R&lt;/sub&gt; 0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain: Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f&lt;sub&gt;p&lt;/sub&gt;</td>
<td>1.00</td>
</tr>
<tr>
<td>E&lt;sub&gt;T&lt;/sub&gt;</td>
<td>1.5</td>
</tr>
<tr>
<td>f&lt;sub&gt;HV&lt;/sub&gt; = 1/[1 + P&lt;sub&gt;T&lt;/sub&gt;(E&lt;sub&gt;T&lt;/sub&gt; - 1) + P&lt;sub&gt;R&lt;/sub&gt;(E&lt;sub&gt;R&lt;/sub&gt; - 1)]</td>
<td>1.000</td>
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### Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>2</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tr>
<td>Operational (LOS)</td>
<td>Design (N)</td>
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<tr>
<td>v&lt;sub&gt;p&lt;/sub&gt; = (V or DDHV) / (PHF x N x f&lt;sub&gt;HV&lt;/sub&gt;) x f&lt;sub&gt;p&lt;/sub&gt;)</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>D = v&lt;sub&gt;p&lt;/sub&gt; / S</td>
<td>21.9 pc/mi/ln</td>
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<tr>
<td>LOS</td>
<td>C</td>
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### Glossary

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
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<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>v&lt;sub&gt;p&lt;/sub&gt;</td>
<td>Flow rate</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
</tr>
<tr>
<td>DDHV</td>
<td>Directional design hour volume</td>
</tr>
<tr>
<td>S</td>
<td>Speed</td>
</tr>
<tr>
<td>D</td>
<td>Density</td>
</tr>
</tbody>
</table>

### Factor Location

<table>
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<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>E&lt;sub&gt;R&lt;/sub&gt; - Exhibits 11-10, 11-12</td>
<td>f&lt;sub&gt;LB&lt;/sub&gt; - Exhibit 11-8</td>
</tr>
<tr>
<td>E&lt;sub&gt;T&lt;/sub&gt; - Exhibits 11-10, 11-11, 11-13</td>
<td>f&lt;sub&gt;LC&lt;/sub&gt; - Exhibit 11-9</td>
</tr>
<tr>
<td>f&lt;sub&gt;p&lt;/sub&gt; - Page 11-18</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, v&lt;sub&gt;p&lt;/sub&gt; - Exhibits 11-2,</td>
<td>11-3</td>
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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
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</table>

## Site Information

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>SR-47/Eastbound</th>
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</thead>
<tbody>
<tr>
<td>From/To</td>
<td>at Vincent Thomas Bridge</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>No Project Alternative (2026)</td>
</tr>
</tbody>
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## Project Description

YTI Project - Port of Los Angeles

## Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V (veh/h)</th>
<th>2523</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT (veh/day)</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>f_p</th>
<th>1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
<tr>
<td>E_R</td>
<td>1.2</td>
</tr>
<tr>
<td>f_HV</td>
<td>1.000</td>
</tr>
</tbody>
</table>

## Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width (ft)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance (ft)</td>
<td></td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>2</td>
</tr>
<tr>
<td>Total Ramp Density, TRD (ramps/mi)</td>
<td></td>
</tr>
<tr>
<td>FFS (measured) (mph)</td>
<td>55.0</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS (mph)</td>
<td></td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
</tr>
<tr>
<td>S = 55.0 mph</td>
</tr>
<tr>
<td>D = v_p / S = 24.4 pc/mi/ln</td>
</tr>
<tr>
<td>LOS = C</td>
</tr>
</tbody>
</table>

## Design (N)

<table>
<thead>
<tr>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design LOS</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
</tr>
<tr>
<td>S = mph</td>
</tr>
<tr>
<td>D = v_p / S = pc/mi/ln</td>
</tr>
</tbody>
</table>

## Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

## Factor Location

<table>
<thead>
<tr>
<th>E_R - Exhibits 11-10, 11-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_LW - Exhibit 11-8</td>
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<tr>
<td>E_T - Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>f_LC - Exhibit 11-9</td>
</tr>
<tr>
<td>f_p - Page 11-18</td>
</tr>
<tr>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
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file:///C:/TEMP/f2k8E39.tmpl
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | SR-91/Westbound |
| From/To                  | East of Alameda St & Santa Fe |
| Jurisdiction             | CALTRANS |
| Analysis Year            | No Project Alternative (2026) |

## Project Description

- **☑ Oper.(LOS)**
- **☐ Des.(N)**
- **☐ Planning Data**

## Flow Inputs

| Volume, V | 9841 veh/h |
| AADT      | veh/day    |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5 |
| f_HV | \( \frac{1}{(1 + P_T \cdot f_T + P_R \cdot E_R \cdot f_E - 1)} \) |

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 6 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, \( BFFS \) | mph |

## Calc Speed Adj and FFS

| f_LW | mph |
| f_LC | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

## LOS and Performance Measures

| Operational (LOS) | \( v_p = \frac{(V \text{ or } DDHV)}{\text{PHF} \times N \times f_{rV}} \times f_p \) |
|                   | pc/h/ln |
|                   | mph    |
|                   | pc/mi/ln |
| LOS               | D |

## Design (N)

| Design (N) | Design LOS |
| v_p = \( \frac{(V \text{ or } DDHV)}{\text{PHF} \times N \times f_{rV}} \times f_p \) | pc/h/ln |
| D = v_p / S | mph |
| Required Number of Lanes, N | pc/mi/ln |

## Glossary

- **N** - Number of lanes
- **V** - Hourly volume
- **\( v_p \)** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume
- **S** - Speed
- **D** - Density
- **BFFS** - Base free-flow speed

## Factor Location

- **E_R** - Exhibits 11-10, 11-12
- **f_{LW}** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3

---

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### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel:** SR-91/Eastbound
- **From/To:** East of Alameda St & Santa Fe
- **Jurisdiction:** CALTRANS
- **Analysis Year:** No Project Alternative (2026)

### Flow Inputs
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>7829 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T 0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D %RVs, P_R 0</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments
- \( f_p = 1.00 \)  
- \( E_R = 1.2 \)  
- \( f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \) 1.000

### Speed Inputs
- **Lane Width** ft  
- **Rt-Side Lat. Clearance** ft  
- **Number of Lanes, N** 6  
- **Total Ramp Density, TRD** ramps/mi  
- **FFS (measured)** 65.0 mph  
- **Base free-flow Speed, BFFS** mph

### LOS and Performance Measures
- **Operational (LOS)**  
  \( v_p = \frac{(V or DDHV)}{(PHF x N x f_{RV}) x f_p} \) 1388 pc/h/ln  
  \( S = 65.0 \) mph  
  \( D = \frac{v_p}{S} \) 21.4 pc/mi/ln  
  **LOS**

### Design (N)
- **Design LOS**  
  \( v_p = \frac{(V or DDHV)}{(PHF x N x f_{RV}) x f_p} \) pc/h/ln  
  \( S = \) mph  
  \( D = \frac{v_p}{S} \) pc/mi/ln  
  **Required Number of Lanes, N**

### Glossary
- **N** - Number of lanes  
- **V** - Hourly volume  
- **V_p** - Flow rate  
- **LOS** - Level of service  
- **DDHV** - Directional design hour volume

---

**Factor Location**

- \( E_R \) - Exhibits 11-10, 11-12  
- \( f_{LVW} \) - Exhibit 11-8  
- \( E_T \) - Exhibits 11-10, 11-11, 11-13  
- \( f_{LC} \) - Exhibit 11-9  
- \( f_p \) - Page 11-18  
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3

---

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<table>
<thead>
<tr>
<th><strong>General Information</strong></th>
<th><strong>Site Information</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst: RA</td>
<td>Highway/Direction of Travel: I-710/Northbound</td>
</tr>
<tr>
<td>Agency or Company: Raju Associates</td>
<td>From/To: n/o I-105 and n/o Firestone</td>
</tr>
<tr>
<td>Date Performed: 8/6/2013</td>
<td>Jurisdiction: CALTRANS</td>
</tr>
<tr>
<td>Analysis Time Period: PM Peak Hour</td>
<td>Analysis Year: No Project Alternative (2026)</td>
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<tr>
<td>Project Description: YTI Project - Port of Los Angeles</td>
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</tr>
<tr>
<td>☑ Oper.(LOS)</td>
<td>☐ Des.(N)</td>
</tr>
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</table>

### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>8003 veh/h</th>
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</thead>
<tbody>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
</tbody>
</table>

DDHV = AADT x K x D

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments

\[
f_p = 1.00 \quad E_p = 1.2 \\
E_T = 1.5 \quad f_{HV} = \frac{1}{f_p(E_p - 1) + P_T(E_T - 1)} 1.000
\]

### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

Operational (LOS)

\[
v_p = \frac{(V \text{ or DDHV}) \times f_{HV}}{(PHF \times N \times f_p)} 2128 \text{ pc/h/ln} \\
v_S = \frac{v_p}{S} 57.5 \text{ mph} \\
D = \frac{v_p}{S} 37.0 \text{ pc/mi/ln} \\
LOS \quad E
\]

Design (N)

Design LOS

\[
v_p = \frac{(V \text{ or DDHV}) \times f_{HV}}{(PHF \times N \times f_p)} 2128 \text{ pc/h/ln} \\
v_S = \frac{v_p}{S} \quad \text{mph} \\
D = \frac{v_p}{S} \quad \text{pc/mi/ln} \\
LOS \quad E
\]

### Glossary

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

### Factor Location

| E_p - Exhibits 11-10, 11-12 | f_{LVW} - Exhibit 11-8 |
| E_s - Exhibits 11-10, 11-11, 11-13 | f_{LC} - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 | |
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

## Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: n/o I-105 & n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: (2026)

## Project Description
- **☑ Oper.(LOS)**
- **☐ Des.(N)**
- **☐ Planning Data**

## Flow Inputs
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (veh/h)</td>
<td>8745</td>
</tr>
<tr>
<td>AADT (veh/day)</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments
- \(f_p\) = 1.00
- \(E_T\) = 1.5
- \(E_R\) = 1.2
- \(f_{HV} = \frac{1}{f_p(1+E_T(E_R-1)) + P_R(E_R-1)}\) = 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD (ramps/mi)**:       |

## LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

## Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

## Factor Location
- **E_R** - Exhibits 11-10, 11-12
- **f_LW** - Exhibit 11-8
- **E_p** - Exhibits 11-10, 11-11, 11-13
- **f_LC** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, V_p** - Exhibits 11-2, 11-3

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3/19/2014
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-110/Northbound |
| From/To | South of C St |
| Jurisdiction | CALTRANS |
| Analysis Year | No Project Alternative (2026) |

## Flow Inputs

| Volume, V (veh/h) | 3136 |
| AADT (veh/day) | |
| Peak-Hr Prop. of AADT, K | |
| Peak-Hr Direction Prop, D | |
| DDHV = AADT x K x D (veh/h) | |

## Calculate Flow Adjustments

$$f_p = 1.00$$

$$E_T = 1.5$$

$$E_R = 1.2$$

$$f_{HV} = \frac{1}{f_p \left( E_T - 1 \right) + P_R \left( E_R - 1 \right)} = 1.000$$

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## Calc Speed Adj and FFS

| Calc Speed Adj | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
<td>S - Speed</td>
</tr>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>$v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p)$</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>S</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>D</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td></td>
</tr>
<tr>
<td>E_R - Exhibits 11-10, 11-12</td>
<td>f_{LVW} - Exhibit 11-8</td>
</tr>
<tr>
<td>E_T - Exhibits 11-10, 11-11, 11-13</td>
<td>f_{LC} - Exhibit 11-9</td>
</tr>
<tr>
<td>f_p - Page 11-18</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3</td>
<td></td>
</tr>
</tbody>
</table>

## Glossary

- N: Number of lanes
- S: Speed
- V: Hourly volume
- D: Density
- $v_p$: Flow rate
- FFS: Free-flow speed
- BFFS: Base free-flow speed
- DDHV: Directional design hour volume

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BASIC FREeways SEGMENTS WORKSHEET

General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
</tbody>
</table>

Site Information

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>I-110/Southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>From/To</td>
<td>South of C St</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>No Project Alternative (2026)</td>
</tr>
</tbody>
</table>

Project Description

YTJ Project - Port of Los Angeles

Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V (veh/h)</th>
<th>4582</th>
<th>Peak-Hour Factor, PHF</th>
<th>0.94</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT (veh/day)</td>
<td></td>
<td>%Trucks and Buses, PT</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
<td>%RVs, PR</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
<td>General Terrain:</td>
<td>Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
<td>Grade % Length mi</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up/Down %</td>
<td></td>
</tr>
</tbody>
</table>

Calculate Flow Adjustments

| f_p | 1.00 | E_R | 1.2 |
| E_T | 1.5  | f_HV = [f_p(E_T - 1)] / [f_p(E_T - 1)] + [f_{ER}(E_R - 1)] | 1.00 |

Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width (ft)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance (ft)</td>
<td></td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD (ramps/mi)</td>
<td></td>
</tr>
<tr>
<td>FFS (measured) (mph)</td>
<td>65.0</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS (mph)</td>
<td></td>
</tr>
</tbody>
</table>

LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>1219 pc/h ln (x f_p)</td>
<td></td>
</tr>
<tr>
<td>S = 65.0 mph</td>
<td></td>
</tr>
<tr>
<td>D = v_p / S</td>
<td></td>
</tr>
<tr>
<td>LOS C</td>
<td></td>
</tr>
</tbody>
</table>

Glossary

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

Factor Location

| E_R - Exhibits 11-10, 11-12 | f_{LW} - Exhibit 11-8 |
| E_T - Exhibits 11-10, 11-11, 11-13 | f_{LC} - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 | |

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

### Site Information
- **Highway/Direction of Travel**: I-405/Northbound
- **From/To**: At Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)
- **Project Description**: YTI Project - Port of Los Angeles

### Flow Inputs
- **Volume, V**: 9238 veh/h
- **AADT**: veh/day
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **Peak-Hr Prop. of AADT, K**: 
- **Peak-Hr Direction Prop, D**: 
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_HV = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Calc Speed Adj and FFS
- **f_LW**
- **f_LC**
- **TRD Adjustment**
- **FFS**
- **FFS Adjustment**

### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

#### Operational (LOS)
- **\( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} x f_p) \)** pc/h/ln
- **\( S = 60.5 \text{ mph} \)**
- **\( D = v_p / S \)** pc/mi/ln
- **LOS**: 

#### Design (N)
- **Design LOS**

### Glossary
- **N - Number of lanes**
- **V - Hourly volume**
- **\( v_p \) - Flow rate**
- **LOS - Level of service**
- **DDHV - Directional design hour volume**

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3**

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**BASIC FREEWAY WORKSHEET**

### General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: PM Peak Hour
- Project Description: YTI Project - Port of Los Angeles
- Highway/Direction of Travel: I-405/Southbound
- From/To: At Santa Fe Av
- Jurisdiction: CALTRANS
- Analysis Year: No Project Alternative (2026)

### Site Information
- QDO\VW
- RA
- LJKZD’LUHFWLRQRI7UDYHO
- I-405/Southbound

### Flow Inputs
- **Volume, V** 11313 veh/h
- **AADT** veh/day
- **Peak-Hour Factor, PHF** 0.94
- **%Trucks and Buses, P_T** 0
- **Peak-Hr Prop. of AADT, K**
- **Peak-Hr Direction Prop, D**
- **DDHV = AADT x K x D** veh/h

### Calculate Flow Adjustments
- **f_p** 1.00
- **E_T** 1.5
- **f_HV = \frac{1}{[1+P_T(E_T - 1) + P_R(E_R - 1)]} 1.000**

### Speed Inputs
- **Lane Width** ft
- **Rt-Side Lat. Clearance** ft
- **Number of Lanes, N** 5
- **Total Ramp Density, TRD** ramps/mi
- **FFS (measured)** 65.0 mph
- **Base free-flow Speed, BFFS** mph

### LOS and Performance Measures

### Design (N)
- **Operational (LOS)**
- **Design LOS**
- **Required Number of Lanes, N**

### Glossary
- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- V_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location
- E_T - Exhibits 11-10, 11-12
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, V_p - Exhibits 11-2, 11-3
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
</tbody>
</table>

### Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | At Alondra Bl |
| Jurisdiction | CALTRANS |
| Analysis Year | No Project Alternative (2026) |

### Project Description

- YTI Project - Port of Los Angeles

### Flow Inputs

- Volume, V: 8772 veh/h
- AADT: 8772 veh/day
- Peak-Hr Prop. of AADT, K: 0.94
- Peak-Hr Direction Prop, D: 0.94
- DDHV = AADT x K x D: 8004 veh/h

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{(\frac{1}{f_{P}} + E_T (E_R - 1) + P_R (E_R - 1)]} \times 1.000 \)

### Speed Inputs

- Lane Width: 11 ft
- Rt-Side Lat. Clearance: 11 ft
- Number of Lanes, N: 5
- Total Ramp Density, TRD: 3 ramps/mi
- FFS (measured): 65.0 mph
- Base free-flow Speed, BFFS: 65.0 mph

### LOS and Performance Measures

- Operational (LOS)
  - \( v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV} \times f_P)} \)
  - \( S = 61.9 \) mph
  - \( D = \frac{v_p}{S} \)
  - \( 30.1 \) pc/mi/in
- LOS
  - LOS

### Design (N)

- Design (N)
  - Design LOS
    - \( v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV} \times f_P)} \)
    - \( S \)
    - \( D = \frac{v_p}{S} \)
    - Required Number of Lanes, N

### Glossary

| N | Number of lanes |
| V | Hourly volume |
| D | Density |
| f | Flow rate |
| LOS | Level of service |
| DDHV | Directional design hour volume |

### Factor Location

| \( E_T \) - Exhibits 11-10, 11-12 | \( f_{LW} \) - Exhibit 11-8 |
| \( E_T \) - Exhibits 11-10, 11-11, 11-13 | \( f_{LC} \) - Exhibit 11-9 |
| \( f_p \) - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3 |
**General Information**

<table>
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<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
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<td>Highway/Direction of Travel I-710/Southbound</td>
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<td>CALTRANS</td>
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**Flow Inputs**

| Volume, V | 7826 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

**Calculate Flow Adjustments**

\[
f_p = 1.00 \quad E_R = 1.2 \quad E_T = 1.5 \quad f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} = 1.000
\]

**Speed Inputs**

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

**Calc Speed Adj and FFS**

| Calc Speed Adj | mph |
| FFS | 65.0 mph |

**LOS and Performance Measures**

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)</td>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)</td>
</tr>
<tr>
<td>S = 64.0 mph</td>
<td>S</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>26.0 pc/mi/ln</td>
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<tr>
<td>LOS</td>
<td>D</td>
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**Glossary**

| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| v_p - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

**Factor Location**

| E_R - Exhibits 11-10, 11-12 | f_{LV} - Exhibit 11-8 |
| E_p - Exhibits 11-10, 11-11, 11-13 | f_{LC} - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 | |

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**General Information**

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

**Site Information**

- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between I-405 & Del Amo Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

**Flow Inputs**

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>7712 veh/h</th>
<th>Peak-Hour Factor, PHF</th>
<th>0.94</th>
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<tr>
<td>AADT</td>
<td>veh/day</td>
<td>%Trucks and Buses, P_T</td>
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</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
<td>%RVs, P_R</td>
<td>0</td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
<td>General Terrain:</td>
<td>Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
<td>Grade</td>
<td>%</td>
</tr>
</tbody>
</table>

**Calculate Flow Adjustments**

- f_p = 1.00
- E_R = 1.2
- f_{HV} = 1/(1 + P_T * (E_T - 1) + P_R * (E_R - 1)) = 1.000

**Speed Inputs**

- Lane Width
- Rt-Side Lat. Clearance
- Number of Lanes, N = 4
- Total Ramp Density, TRD
- FFS (measured) = 55.0 mph
- Base free-flow Speed, BFFS

**Calc Speed Adj and FFS**

- f_{LW} mph
- f_{LC} mph
- TRD Adjustment mph
- FFS mph

**LOS and Performance Measures**

- Operational (LOS)
- Design (N)

**Glossary**

- N - Number of lanes
- V - Hourly volume
- V_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

- E_R - Exhibits 11-10, 11-12
- E_T - Exhibits 11-10, 11-11, 11-13
- f_p - Page 11-18
- TRD - Page 11-11

- LOS, S, FFS, V_p - Exhibits 11-2, 11-3

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# BASIC FREEWAY WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between I-405 & Del Amo Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

## Flow Inputs
- **Volume, V**: 7041 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: 
- **Peak-Hr Direction Prop, D**: 
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade %**: 
- **Length mi**: 
- **Up/Down %**: 

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **fHV = 1/(1 + P_T(f_T - 1) + P_R(f_R - 1))**: 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures
- **Operational (LOS)**: 
  - **v_p = (V or DDHV) / (PHF x N x f_RV x f_p)**: pc/h/ln
  - **S**: 54.9 mph
  - **D = v_p / S**: 34.1 pc/mi/ln
  - **LOS**: D
- **Design (N)**: 
  - **v_p = (V or DDHV) / (PHF x N x f_RV x f_p)**: pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **Required Number of Lanes, N**

## Glossary
- **N - Number of lanes**
- **V - Hourly volume**
- **V_p - Flow rate**
- **LOS - Level of service**
- **DDHV - Directional design hour volume**

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3/19/2014
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between PCH & Willow St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

### Flow Inputs
- **Volume, V**: 5725 veh/h
- **AADT**: veh/day
- **Peak-Hour Factor, PHF**: 0.94
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **$f_p$**: 1.00
- **$E_T$**: 1.5
- **$f_HV = \frac{1}{1/PHF + P_T + \frac{1}{PHF}} (1.00)$**: 1.00

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - $v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV} \times f_p)}$ pc/h/ln
  - $S = \frac{53.7 \text{ mph}}{37.8 \text{ pc/mi/ln}}$
  - $D = \frac{v_p}{S}$
  - $E = \frac{v_p}{S}$

### Design (N)
- **Design LOS**
  - $v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV} \times f_p)}$ pc/h/ln
  - $S$ mph
  - $D = \frac{v_p}{S}$ pc/mi/ln
  - **Required Number of Lanes, N**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **$v_p$**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

### Factor Location
- **$E_R$: Exhibits 11-10, 11-12**
- **$f_{LV}$**: Exhibit 11-8
- **$E_T$: Exhibits 11-10, 11-11, 11-13**
- **$f_{LC}$**: Exhibit 11-9
- **$f_p$: Page 11-18**
- **TRD**: Page 11-11

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**BASIC FREEWAY SEGMENTS WORKSHEET**

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### Flow Inputs

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<td>Volume, V</td>
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<td>AADT (veh/day)</td>
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<td>Peak-Hr Direction Prop, D</td>
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<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
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<td>Peak-Hour Factor, PHF</td>
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<tr>
<td>%RVs, P_R</td>
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### Calculate Flow Adjustments

\[
f_p = 1.00 \quad E_R = 1.2 \quad E_T = 1.5 \quad f_{HV} = \frac{1}{f_p [1 + P_T (E_T - 1) + P_R (E_R - 1)]} 1.000
\]

### Speed Inputs

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<td>Lane Width</td>
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<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
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<td>Number of Lanes, N</td>
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<tr>
<td>Total Ramp Density, TRD (ramps/mi)</td>
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<tr>
<td>FFS (measured)</td>
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<td>Base free-flow Speed, BFFS</td>
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### LOS and Performance Measures

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<th>Value</th>
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<tr>
<td>Design (N)</td>
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### Glossary

- N - Number of lanes
- V - Hourly volume
- V_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

**Factor Location**

- E_R - Exhibits 11-10, 11-12
- f_p - Page 11-18
- TRD - Page 11-11
- E_p - Exhibits 11-10, 11-11, 11-13
- f_{LV} - Exhibit 11-8
- f_{LC} - Exhibit 11-9

**Design LOS**

\[
v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} 2186 \text{ pc/h/ln} \quad S = 51.3 \text{ mph} \quad D = \frac{v_p}{S} 42.6 \text{ pc/mi/ln} \quad LOS = E
\]

- Required Number of Lanes, N

**Design (N)**

\[
v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \quad S = \text{ mph} \quad D = \frac{v_p}{S} \quad \text{pc/mi/ln} \quad \text{LOS, S, FFS, v_p - Exhibits 11-2, 11-3}
\]

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

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<th>RA</th>
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<td>Raju Associates</td>
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<tr>
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<td>PM Peak Hour</td>
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### Site Information

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<th>I-710/Northbound</th>
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<td>North of Florence Av</td>
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<td>CALTRANS</td>
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<td>Analysis Year</td>
<td>No Project Alternative (2026)</td>
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</table>

### Project Description

- **YTI Project - Port of Los Angeles**
- **Oper.(LOS)**

### Flow Inputs

| Volume, V | 7264 veh/h |
| AADT      | veh/day    |
| Peak-Hr Prop. of AADT, K | %RVs, P_R   |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | veh/h Grade % Length mi Up/Down % |

### Calculate Flow Adjustments

- **f_p** = 1.00
- **E_T** = 1.5
- \[ f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \]
- **E_R** = 1.2

### Speed Inputs

- **Lane Width** ft
- **Rt-Side Lat. Clearance** ft
- **Number of Lanes, N** 4
- **Total Ramp Density, TRD** ramps/mi
- **FFS (measured)** 65.0 mph

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
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<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_p x f_{HV})</td>
<td>Design LOS</td>
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<tr>
<td>S</td>
<td>61.0 mph</td>
</tr>
<tr>
<td>D</td>
<td>31.7 pc/mi</td>
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<td>LOS</td>
<td>D</td>
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### Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- FFS - Free-flow speed
- BFFS - Base free-flow speed
- E_R - Exhibits 11-10, 11-12
- f_{LV} - Exhibit 11-8
- E_p - Exhibits 11-10, 11-11, 11-13
- f_{LC} - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3

### Factor Location

<table>
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<tr>
<th>E_R - Exhibits 11-10, 11-12</th>
<th>f_{LV} - Exhibit 11-8</th>
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<tr>
<td>f_p - Page 11-18</td>
<td>TRD - Page 11-11</td>
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<tr>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
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</table>
### General Information

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information

- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: (2026)

### Flow Inputs

<table>
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<th>Flow</th>
<th>Value</th>
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<tbody>
<tr>
<td>Volume, V</td>
<td>8127 veh/h</td>
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<tr>
<td>AADT</td>
<td>39127 veh/day</td>
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<td>Peak-Hr Prop. of AADT, K</td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1 + P_T (E_T - 1) + P_R (E_R - 1)}{E_R} = 1.000 \)

### Speed Inputs

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures

- **Operational (LOS)**
- **Design (N)**

### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **\( V_p \)**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

**Factor Location**

- \( E_R \): Exhibits 11-10, 11-12
- \( f_{LVW} \): Exhibit 11-8
- \( f_{LC} \): Exhibit 11-9
- \( f_p \): Page 11-18
- **TRD**: Page 11-11

---

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: SR-47 Northbound at Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

### Site Information
- **From/To**: at Cdre. Schuyler Heim Bridge
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade**: Up/Down %
- **Length**: mi

### Flow Inputs
- **Volume, V**: 1066 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: veh/h
- **Peak-Hr Direction Prop., D**: veh/h
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **f_{HV} = 1/[1+P_T(f_T - 1) + P_R(f_R - 1)]**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_{RV})**
  - **x f_p)**
  - **S**: 55.0 mph
  - **D = v_p / S**: 6.9 pc/mi/ln
  - **LOS**: A

### Design (N)
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_{RV})**
  - **x f_p)**
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

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3/19/2014
## BASIC FREeway SEGMENTS WORKSHEET

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles
- **Jurisdiction:** CALTRANS
- **Highway/Direction of Travel:** SR-47 Southbound
- **From/To:** at Cdre. Schuyler Heim Bridge
- **Analysis Year:** No Project Alternative (2026)

### Site Information
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, \( P_T \):** 0
- **%RVs, \( P_R \):** 0
- **General Terrain:** Level
- **Grade % Length mi:** Up/Down %

### Flow Inputs
- **Volume, \( V \):** 821 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, \( K \):**
- **Peak-Hr Direction Prop, \( D \):**
- **DDHV = AADT x K x D:** veh/h

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, \( N \):** 3
- **Total Ramp Density, \( TRD \):** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed:** mph

### LOS and Performance Measures
- **Operational (LOS):**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{RV} \times f_p)} \) pc/h/ln
  - \( S = 55.0 \) mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - LOS

### Design (N)
- **Design LOS:**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{RV} \times f_p)} \) pc/h/ln
  - \( S \) mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - Required Number of Lanes, \( N \)

### Glossary
- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( f_p \) - Flow rate
- \( LOS \) - Level of service
- \( DDHV \) - Directional design hour volume

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1 + \frac{p_T}{1} + \frac{P_R}{1}] \times 1000 \)

### Calc Speed Adj and FFS
- **Calc Speed Adj:**
  - \( f_{LC} \) mph
  - TRD Adjustment mph
- **FFS:** 55.0 mph

### Factor Location
- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

### Flow Inputs
- **Volume, V**: 3050 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **f_HV = 1/(1 + P_T (E_T - 1) + P_R (E_R - 1))**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - \( V_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \)
  - \( S \)
  - \( D = \frac{v_p}{S} \)
  - **LOS**
- **Design (N)**
  - **Design LOS**
  - **Design (N)**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \)
  - **S**
  - \( D = \frac{v_p}{S} \)
  - **LOS**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_p**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
- **TRD**: Page 11-11

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## Basic Freeway Segments Worksheet

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles
- **Highway/Direction of Travel:** SR-47/Eastbound
- **From/To:** at Vincent Thomas Bridge
- **Jurisdiction:** CALTRANS
- **Analysis Year:** No Project Alternative
- **(2026)**

### Site Information
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, \( P_T \):** 0
- **%RVs, \( P_R \):** 0
- **General Terrain:** Level
- **% Down:**
- **Grade:**
- **Length:** mi

### Flow Inputs
- **Volume, \( V \):** 2698 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, \( K \):**
- **Peak-Hr Direction Prop, \( D \):**
- **DDHV = AADT x K x D:** veh/h

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_R = 1.2 \)

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, \( N \):** 2
- **Total Ramp Density, \( TRD \):** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed:** mph

### LOS and Performance Measures
- **Design (N):**
  - **Operational (LOS):**
    - \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{hv}^{1435})} \text{ pc/h/ln} \)
    - \( S = 55.0 \text{ mph} \)
    - \( D = v_p / S \text{ pc/mi/ln} \)
  - **LOS:**
    - \( E_p = \frac{1}{f_{hv}^{1435} + \frac{1}{(N \times f_{hv})^{1435}}} \text{ pc/h/ln} \)
    - \( S = 55.0 \text{ mph} \)
    - \( D = v_p / S \text{ pc/mi/ln} \)

### Glossary
- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- \( LOS \) - Level of service
- \( DDHV \) - Directional design hour volume
- \( S \) - Speed
- \( D \) - Density
- \( FFS \) - Free-flow speed
- \( BFFS \) - Base free-flow speed

### Factor Location
- \( E_p \) - Exhibits 11-10, 11-12
- \( f_{hv}^{1435} \) - Exhibit 11-8
- \( E_p \) - Exhibits 11-10, 11-11, 11-13
- \( f_{hv}^{1435} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- \( TRD \) - Page 11-11
- \( LOS, S, FFS, v_p \) - Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: SR-91/Westbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

## Flow Inputs
- **Volume, V**: 7082 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0

## Calculate Flow Adjustments
- **\( f_p \)**: 1.00
- **\( E_R \)**: 1.2
- \( f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \)

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, \( N \)**: 6
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## Calc Speed Adj and FFS
- **\( f_{LO} \)**
- **\( f_{LC} \)**

## LOS and Performance Measures
- **LOS**: D = \( \frac{v_p}{S} \)
- **FFS**: 65.0 mph

## Design (N)
- **Design LOS**: \( V_p = \frac{(V or DDHV)}{PHF x N x f_{RV}} \)
- **Design N**: Required Number of Lanes, \( N \)

## Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **\( v_p \)**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

## Site Information
- **Highway/Direction of Travel**: SR-91/Eastbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Project Alternative (2026)

## Project Description
- **Project**: YTI Project - Port of Los Angeles
- **Oper.(LOS)**, **Des.(N)**, **Planning Data**

## Flow Inputs
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>9129 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
<tr>
<td>%Trucks and Buses, P_T</td>
<td>0</td>
</tr>
<tr>
<td>%RVs, P_R</td>
<td>0</td>
</tr>
<tr>
<td>General Terrain: Level</td>
<td></td>
</tr>
<tr>
<td>Up/Down %</td>
<td></td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **f_HV** = 1/[(1 + P_T * f_p) + P_R * E_R] = 1.000

## Speed Inputs
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>6</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

## Calc Speed Adj and FFS
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFS</td>
<td>65.0 mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{hv}) \times f_p} \)
  - \( S = 64.3 \text{ mph} \)
  - \( D = \frac{v_p}{S} \)
  - \( D = \frac{v_p}{S} \)

## Design (N)
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design (N)</td>
<td></td>
</tr>
<tr>
<td>Design LOS</td>
<td></td>
</tr>
</tbody>
</table>

## Glossary
- **N** - Number of lanes
- **V** - Hourly volume
- **v_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

## Factor Location
- **E_R** - Exhibits 11-10, 11-12
- **f_LW** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_LC** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3

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NO FEDERAL ACTION (2026) – ALTERNATIVE 2

AM/PM PEAK HOURS
<table>
<thead>
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<th><strong>General Information</strong></th>
<th><strong>Site Information</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Flow Inputs</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
</tr>
<tr>
<td>AADT</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Calculate Flow Adjustments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>$f_p$</td>
</tr>
<tr>
<td>$E_T$</td>
</tr>
<tr>
<td>$f_{HV}$ = $\frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Speed Inputs</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
</tr>
<tr>
<td>FFS (measured)</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Calc Speed Adj and FFS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>$f_LW$</td>
</tr>
<tr>
<td>$f_{LC}$</td>
</tr>
<tr>
<td>TRD Adjustment</td>
</tr>
<tr>
<td>FFS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>LOS and Performance Measures</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
</tr>
<tr>
<td>$v_p = (V \text{ or } DDHV) / (PHF x N x f_{HV} x f_p)$</td>
</tr>
<tr>
<td>$S$</td>
</tr>
<tr>
<td>$D = v_p / S$</td>
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<tr>
<td>LOS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Design (N)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Design LOS</td>
</tr>
<tr>
<td>$v_p = (V \text{ or } DDHV) / (PHF x N x f_{HV} x f_p)$</td>
</tr>
<tr>
<td>$S$</td>
</tr>
<tr>
<td>$D = v_p / S$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Glossary</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
</tr>
<tr>
<td>V - Hourly volume</td>
</tr>
<tr>
<td>$v_p$ - Flow rate</td>
</tr>
<tr>
<td>LOS - Level of service</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Factor Location</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>$E_R$ - Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>$E_T$ - Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>$f_p$ - Page 11-18</td>
</tr>
<tr>
<td>LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3</td>
</tr>
</tbody>
</table>
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
<tr>
<td>Highway/Direction of Travel</td>
<td>I-110/Southbound</td>
</tr>
<tr>
<td>From/To</td>
<td>South of C St</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>No Federal Action (2026)</td>
</tr>
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</table>

## Site Information

<table>
<thead>
<tr>
<th>Site Information</th>
<th></th>
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<tbody>
<tr>
<td>Peak-Hour Factor, PHF</td>
<td>0.94</td>
</tr>
<tr>
<td>%Trucks and Buses, P_T</td>
<td>0</td>
</tr>
<tr>
<td>%RVs, P_R</td>
<td>0</td>
</tr>
<tr>
<td>General Terrain</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
</tr>
<tr>
<td>Up/Down %</td>
<td></td>
</tr>
</tbody>
</table>

## Flow Inputs

<table>
<thead>
<tr>
<th>Flow Inputs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>3317 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Calculate Flow Adjustments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>f_p</td>
<td>1.00</td>
</tr>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
<tr>
<td>f_HV = 1/(1+P_T(E_T - 1) + P_R(E_R - 1)]</td>
<td>1.000</td>
</tr>
</tbody>
</table>

## Speed Inputs

<table>
<thead>
<tr>
<th>Speed Inputs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>LOS and Performance Measures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td>Design (N)</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
</tr>
<tr>
<td>S</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>13.6 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>B</td>
</tr>
</tbody>
</table>

## Glossary

<table>
<thead>
<tr>
<th>Glossary</th>
<th>Factor Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
<td>E_R - Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>V - Hourly volume</td>
<td>f_LW - Exhibit 11-8</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>E_T - Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>f_LC - Exhibit 11-9</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td>f_p - Page 11-18</td>
</tr>
<tr>
<td>BFFS - Base free-flow speed</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>FFS - Free-flow speed</td>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
</tr>
</tbody>
</table>
# Basic Freeway Segments Worksheet

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
</tbody>
</table>

### Site Information

- Highway/Direction of Travel: I-405/Northbound
- From/To: At Santa Fe Av
- Jurisdiction: CALTRANS
- Analysis Year: No Federal Action (2026)

## Project Description

- YTI Project - Port of Los Angeles

## Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>11854 veh/h</th>
<th>Peak-Hour Factor, PHF</th>
<th>0.94</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td></td>
<td>%Trucks and Buses, P_T</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
<td>%RVs, P_R</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
<td>General Terrain:</td>
<td>Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td></td>
<td>Grade % Length mi</td>
<td></td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{(1 + p_T (E_T - 1)) + p_R (E_R - 1)} \times 1.000 \)

## Speed Inputs

- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 5
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 65.0 mph
- Base free-flow Speed, BFFS: mph

## LOS and Performance Measures

### Operational (LOS)

- \( v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \)
- \( S = \frac{2522}{47.1} \text{ mph} \)
- \( D = \frac{v_p}{S} \)

### Design (N)

- \( v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \)
- \( S = \) mph
- \( D = \frac{v_p}{S} \)

### Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- \( v_p \) - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- BFFS - Base free-flow speed
- DDHV - Directional design hour volume

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel:** I-405/Southbound
- **From/To:** At Santa Fe Av
- **Jurisdiction:** CALTRANS
- **Analysis Year:** No Federal Action (2026)

### Flow Inputs
- **Volume, V:** 7526 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:** %
- **Peak-Hr Direction Prop, D:** %
- **DDHV = AADT x K x D:** veh/h

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_T:** 1.5
- **E_R:** 1.2
- **f_{HV} = 1/(1+P_T(E_T - 1) + P_R(E_R - 1)] 1.000**

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 5
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

### LOS and Performance Measures
- **Operational (LOS):**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}) \times f_p} \)
  - \( S = \frac{v_p}{D} \)
  - \( C = \frac{v_p}{S} \)

### Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **f_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_{LV} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

---

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### BASIC FREEWAY SEGMENTS WORKSHEET

**General Information**
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

**Site Information**
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: At Alondra Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

**Flow Inputs**
- **Volume, V**: 7676 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hr Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **Grade**: %
- **Length**: mi
- **Up/Down %**:

**Calculate Flow Adjustments**
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/[(1+P_T(E_T - 1)) + P_R(E_R - 1)]**: 1.000

**Speed Inputs**
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

**Calc Speed Adj and FFS**
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

**LOS and Performance Measures**
- **Operational (LOS)**
- **v_p = (V or DDHV) / (PHF x N x f_HV x f_p)**: 1633 pc/h/ln
- **S**: 64.2 mph
- **D = v_p / S**: 25.4 pc/mi/ln
- **LOS**: C

**Design (N)**
- **Design LOS**
- **v_p = (V or DDHV) / (PHF x N x f_HV x f_p)**: pc/h/ln
- **S**: mph
- **D = v_p / S**: pc/mi/ln

**Glossary**
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

---

**Factor Location**
- **E_R - Exhibits 11-10, 11-12**: f_LW - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_LC - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-710/Southbound |
| From/To | At Alondra Bl |
| Jurisdiction | CALTRANS |
| Analysis Year | No Federal Action (2026) |

## Flow Inputs

| Volume, V | 9915 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT | veh/day | %Trucks and Buses, P_T | 0 |
| Peak-Hr Prop. of AADT, K | | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D | | General Terrain: | Level |
| DDHV = AADT x K x D | veh/h | Grade | |

## Calculate Flow Adjustments

\[
f_p = 1.00 \quad E_T = 1.5 \quad f_{HV} = \frac{1}{1 + f_p E_T} + P_R (E_T - 1) = 1.000
\]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |

## Calc Speed Adj and FFS

| \( f_{LW} \) | mph |
| \( f_{LC} \) | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = \frac{(V \text{ or DDHV}) \times f_{HV}}{(PHF \times N \times f_p \times S) \times 2110} \text{ pc/h/ln} )</td>
<td>( v_p = \frac{(V \text{ or DDHV}) \times f_{HV}}{(PHF \times N \times f_p) \times S} \text{ pc/h/ln} )</td>
</tr>
<tr>
<td>S</td>
<td>57.9 mph</td>
</tr>
<tr>
<td>D = ( v_p / S )</td>
<td>36.5 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>E</td>
</tr>
<tr>
<td>Design LOS</td>
<td>Required Number of Lanes, N</td>
</tr>
</tbody>
</table>

## Glossary

| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| \( v_p - \text{Flow rate} \) | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

\( E_R - \text{Exhibits 11-10, 11-12} \quad f_{LW} - \text{Exhibit 11-8} \)
\( E_T - \text{Exhibits 11-10, 11-11, 11-13} \quad f_{LC} - \text{Exhibit 11-9} \)
\( f_p - \text{Page 11-18} \quad \) TRD - Page 11-11
\( \) LOS, S, FFS, \( v_p - \text{Exhibits 11-2, 11-3} \)

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3/19/2014
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between I-405 & Del Amo Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

### Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>7181 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%RVs, P_R</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ E_R = 1.2 \]
\[ f_{HV} = \frac{1}{[1+P_T(E_T-1) + P_R(E_R-1)]} \times 1.000 \]

### Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td>Design (N)</td>
</tr>
<tr>
<td>Design LOS</td>
<td>Design (N)</td>
</tr>
<tr>
<td>Design LOS</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{hv} \times f_p)</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>54.7 mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>34.9 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>D</td>
</tr>
</tbody>
</table>

### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density

### Factor Location

- \( E_R \): Exhibits 11-10, 11-12
- \( f_{LW} \): Exhibit 11-8
- \( E_T \): Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \): Exhibit 11-9
- \( f_p \): Page 11-18
- \( TRD \): Page 11-11
- \( LOS \), S, FFS, v_p : Exhibits 11-2, 11-3

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### BASIC FREEWAY SEGMENTS WORKSHEET

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<tr>
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</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

#### Site Information

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>I-710/Southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>From/To</td>
<td>Between I-405 &amp; Del Amo Bi</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
</tbody>
</table>

- **Oper.(LOS)**
- **Des.(N)**
- **Planning Data**

#### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>8097 veh/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td>8097 veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td></td>
</tr>
</tbody>
</table>

| Peak-Hour Factor, PHF | 0.94 |
| %Trucks and Buses, P_T | 0 |
| %RVs, P_R | 0 |
| General Terrain: | Level |

#### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{[f(1+P_T(E_T-1) + P_R(E_R-1)]} = 1.000 \)

#### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
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<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
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</tr>
<tr>
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<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
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<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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#### LOS and Performance Measures

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<th>Design (N)</th>
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<tr>
<td>( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV} \times f_p)} )</td>
<td>( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV} \times f_p)} )</td>
</tr>
<tr>
<td>( S )</td>
<td>( S )</td>
</tr>
<tr>
<td>( D = \frac{v_p}{S} )</td>
<td>( D = \frac{v_p}{S} )</td>
</tr>
<tr>
<td>LOS</td>
<td>Required Number of Lanes, N</td>
</tr>
</tbody>
</table>

#### Glossary

- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume
- **BFFS** - Base free-flow speed

#### Factor Location

- **E_R** - Exhibits 11-10, 11-12
- **f_{LVW}** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | Between PCH & Willow St |
| Jurisdiction | CALTRANS |
| Analysis Year | No Federal Action (2026) |

## Project Description

YTI Project - Port of Los Angeles

## Flow Inputs

| Volume, V | 5998 veh/h |
| Peak-Hour Factor, PHF | 0.94 |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ f_{HV} = \frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)} \times 1.000 \]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 3 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 55.0 mph |

## Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>Calc Speed Adj and FFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_{LW}</td>
</tr>
<tr>
<td>f_{LC}</td>
</tr>
<tr>
<td>TRD Adjustment</td>
</tr>
<tr>
<td>FFS</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>LOS and Performance Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
</tr>
<tr>
<td>V_p = (V or DDHV) / (PHF x N x f_{HV})</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>D = V_p / S</td>
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<tr>
<td>LOS E</td>
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## Design (N)

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Design LOS</td>
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<tr>
<td>V_p = (V or DDHV) / (PHF x N x f_{HV})</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>D = V_p / S</td>
</tr>
<tr>
<td>Required Number of Lanes, N</td>
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</tbody>
</table>

## Glossary

| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| V_p - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume |

## Factor Location

<p>| E_R - Exhibits 11-10, 11-12 | f_{LW} - Exhibit 11-8 |
| E_T - Exhibits 11-10, 11-11, 11-13 | f_{LC} - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 |</p>
<table>
<thead>
<tr>
<th>General Information</th>
<th>Site Information</th>
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<tr>
<td><strong>Analyst</strong></td>
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<td>From/To</td>
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<tr>
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<td>Between PCH &amp; Willow St</td>
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<td><strong>Des.(N)</strong></td>
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<td><strong>Flow Inputs</strong></td>
<td><strong>Planning Data</strong></td>
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<td><strong>Oper.(LOS)</strong>: Port of Los Angeles</td>
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<td><strong>Design(N)</strong>:</td>
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<td><strong>Design(L)</strong>:</td>
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<tr>
<td><strong>Peak-Hr Direction Prop, D</strong></td>
<td><strong>Design(L)</strong>:</td>
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<tr>
<td><strong>DDHV = AADT x K x D</strong></td>
<td><strong>Design(L)</strong>:</td>
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<td><strong>Flow Inputs</strong></td>
<td><strong>Design(L)</strong>:</td>
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<td><strong>Calculate Flow Adjustments</strong></td>
<td><strong>Design(L)</strong>:</td>
</tr>
<tr>
<td><strong>f_p</strong></td>
<td><strong>Design(L)</strong>:</td>
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<tr>
<td><strong>E_T</strong></td>
<td><strong>Design(L)</strong>:</td>
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<td><strong>Speed Inputs</strong></td>
<td><strong>Calc Speed Adj and FFS</strong></td>
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<tr>
<td><strong>Lane Width</strong></td>
<td><strong>Speed Inputs</strong></td>
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<td><strong>Rt-Side Lat. Clearance</strong></td>
<td><strong>Calc Speed Adj and FFS</strong></td>
</tr>
<tr>
<td><strong>Number of Lanes, N</strong></td>
<td><strong>Calc Speed Adj and FFS</strong></td>
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<tr>
<td><strong>Total Ramp Density, TRD</strong></td>
<td><strong>Calc Speed Adj and FFS</strong></td>
</tr>
<tr>
<td><strong>FFS (measured)</strong></td>
<td><strong>Calc Speed Adj and FFS</strong></td>
</tr>
<tr>
<td><strong>Base free-flow Speed, BFFS</strong></td>
<td><strong>Calc Speed Adj and FFS</strong></td>
</tr>
<tr>
<td><strong>LOS and Performance Measures</strong></td>
<td><strong>Design(N)</strong></td>
</tr>
<tr>
<td><strong>Operational (LOS)</strong></td>
<td><strong>Design(N)</strong></td>
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<tr>
<td><strong>v_p = (V or DDHV) / (PHF x N x f_fHV) x f_p</strong></td>
<td><strong>Design(N)</strong></td>
</tr>
<tr>
<td><strong>S</strong></td>
<td><strong>Design(N)</strong></td>
</tr>
<tr>
<td><strong>D = v_p / S</strong></td>
<td><strong>Design(N)</strong></td>
</tr>
<tr>
<td><strong>LOS</strong></td>
<td><strong>Design(N)</strong></td>
</tr>
<tr>
<td><strong>Glossary</strong></td>
<td><strong>Factor Location</strong></td>
</tr>
<tr>
<td><strong>N</strong> - Number of lanes</td>
<td><strong>ER - Exhibits 11-10, 11-12</strong></td>
</tr>
<tr>
<td><strong>V</strong> - Hourly volume</td>
<td><strong>f_LW - Exhibit 11-8</strong></td>
</tr>
<tr>
<td><strong>v_p</strong> - Flow rate</td>
<td><strong>ET - Exhibits 11-10, 11-11, 11-13</strong></td>
</tr>
<tr>
<td><strong>LOS</strong> - Level of service</td>
<td><strong>f_LT - Exhibit 11-9</strong></td>
</tr>
<tr>
<td><strong>DDHV</strong> - Directional design hour volume</td>
<td><strong>f_p - Page 11-18</strong></td>
</tr>
<tr>
<td></td>
<td><strong>ff - Page 11-18</strong></td>
</tr>
<tr>
<td></td>
<td><strong>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</strong></td>
</tr>
</tbody>
</table>

**Flow Inputs**

- **Volume, V**: 6836 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h

**Calculate Flow Adjustments**

- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_fHV = 1/(1+P_f(E_T - 1) + P_f(E_R - 1))**: 1.000

**Speed Inputs**

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

**LOS and Performance Measures**

- **v_p = (V or DDHV) / (PHF x N x f_fHV) x f_p**: pc/h/ln
- **S**: 45.4 mph
- **D = v_p / S**: pc/mi/ln
- **LOS**: F

**Glossary**

- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

**Factor Location**

- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **ET - Exhibits 11-10, 11-11, 11-13**
- **f_LT - Exhibit 11-9**
- **f_p - Page 11-18**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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</table>

## Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | North of Florence Av |
| Jurisdiction | CALTRANS |
| Analysis Year | No Federal Action (2026) |

## Project Description

- YTI Project - Port of Los Angeles

### Oper.(LOS) | Des.(N) | Planning Data

## Flow Inputs

| Volume, V | 8924 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %RVs, P_R |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ E_R = 1.2 \]
\[ f_{HV} = \frac{1}{1 + f_p \left( E_T - 1 \right) + P_R \left( E_R - 1 \right)} \]

\[ 1.000 \]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed | mph |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p) ]</td>
<td>Design LOS</td>
</tr>
<tr>
<td>S</td>
<td>51.6 mph</td>
</tr>
<tr>
<td>D = \frac{v_p}{S}</td>
<td>46.0 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>F</td>
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</table>

## Glossary

| N | Number of lanes |
| V | Hourly volume |
| D | Density |
| f_p | Flow rate |
| LOS | Level of service |
| DDHV | Directional design hour volume |

## Factor Location

| E_R | Exhibits 11-10, 11-12 |
| f_{HV} | Exhibit 11-8 |
| E_T | Exhibits 11-10, 11-11, 11-13 |
| f_{LC} | Exhibit 11-9 |
| f_p | Page 11-18 |
| TRD | Page 11-11 |
| LOS, S, FFS, v_p | Exhibits 11-2, 11-3 |
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **DatePerformed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

### Flow Inputs

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<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Volume, V</td>
<td>7321 veh/h</td>
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<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%RVs, P_R</td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain: Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

\[
f_p = 1.00 \quad E_R = 1.2 \quad f_{HV} = \frac{1}{1 + P_T(E_R - 1) + P_R(E_R - 1)} 1.000
\]

### Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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### Speed Adj. and FFS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Formula</th>
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<tbody>
<tr>
<td>f_LW</td>
<td>mph</td>
</tr>
<tr>
<td>f_LC</td>
<td>mph</td>
</tr>
<tr>
<td>TRD Adjustment</td>
<td>mph</td>
</tr>
<tr>
<td>FFS</td>
<td>65.0 mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
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<tbody>
<tr>
<td>Operational (LOS)</td>
<td>Design (N)</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>pc/mi/ln</td>
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<td>LOS</td>
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### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>D</td>
<td>Density</td>
</tr>
<tr>
<td>f_p</td>
<td>Flow rate</td>
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<td>LOS</td>
<td>Level of service</td>
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<tr>
<td>BFFS</td>
<td>Base free-flow speed</td>
</tr>
<tr>
<td>DDHV</td>
<td>Directional design hour volume</td>
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</table>

### Factor Location

<table>
<thead>
<tr>
<th>E_R - Exhibits</th>
<th>f_{HV} - Exhibit</th>
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</thead>
<tbody>
<tr>
<td>11-10, 11-12</td>
<td>11-8</td>
</tr>
<tr>
<td>11-10, 11-11, 11-13</td>
<td>11-9</td>
</tr>
<tr>
<td>f_p - Page 11-18</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
<td></td>
</tr>
</tbody>
</table>

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### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: n/o I-105 and n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

### Flow Inputs
- **Volume, V**: 8949 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Flow Adjustment Calculation
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_HV = 1/[1 + P_T + P_R(E_R - 1)]: 1.000**

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_LW - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_LC - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
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## Flow Inputs

<table>
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<td>Volume, V</td>
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<td>AADT</td>
<td>veh/day</td>
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<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T</td>
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<td>Peak-Hr Direction Prop, D</td>
<td>%RVs, P_R</td>
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<tr>
<td>DDHV = AADT x K x D</td>
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## Calculate Flow Adjustments

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<tbody>
<tr>
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<td>1.00</td>
</tr>
<tr>
<td>E_t</td>
<td>1.5</td>
</tr>
<tr>
<td>E_R</td>
<td>1.2</td>
</tr>
<tr>
<td>f_HV = 1/[(1+P_T)(E_t-1) + P_R(E_R-1)]</td>
<td>1.000</td>
</tr>
</tbody>
</table>

## Speed Inputs

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<td>f_LC</td>
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<tr>
<td>TRD Adjustment</td>
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<td>FFS</td>
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<td>Design (N)</td>
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## Glossary

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<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
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<td>v_p</td>
<td>Flow rate</td>
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<td>Level of service speed</td>
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<tr>
<td>DDHV</td>
<td>Directional design hour volume</td>
</tr>
<tr>
<td>S</td>
<td>Speed</td>
</tr>
<tr>
<td>D</td>
<td>Density</td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
<tr>
<td>E_R - Exhibits 11-10, 11-12</td>
<td></td>
</tr>
<tr>
<td>f_LW - Exhibit 11-8</td>
<td></td>
</tr>
<tr>
<td>E_t - Exhibits 11-10, 11-11, 11-13</td>
<td></td>
</tr>
<tr>
<td>f_LC - Exhibit 11-9</td>
<td></td>
</tr>
<tr>
<td>f_p - Page 11-18</td>
<td></td>
</tr>
<tr>
<td>TRD - Page 11-11</td>
<td></td>
</tr>
<tr>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
<td></td>
</tr>
</tbody>
</table>
## Basic Freeway Worksheet

### General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: AM Peak Hour

### Site Information
- Highway/Direction of Travel: SR-47 Northbound at Cdre. Schuyler Heim Bridge
- Jurisdiction: CALTRANS
- Analysis Year: No Federal Action (2026)

### Project Description
- YTI Project - Port of Los Angeles

### Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, ( V )</td>
<td>581 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, ( K )</td>
<td>%RVs, ( P_R )</td>
</tr>
<tr>
<td>DDHV = AADT ( x ) ( K ) ( x ) ( D )</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

\[
f_P = 1.00 \quad E_T = 1.5 \quad f_{HV} = \frac{1}{f_P [E_T + \frac{U}{D}]} \]

### Speed Inputs

- Lane Width: ft
- Number of Lanes, \( N \): 3
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 55.0 mph
- Base free-flow speed, BFFS: mph

### Speed Outputs

- \( f_{LW} \), mph
- \( f_{LC} \), mph
- TRD Adjustment, mph
- FFS, mph

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV} \times f_P)} \times 206 ) pc/h/ln</td>
<td></td>
</tr>
<tr>
<td>( S )</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>( D = \frac{v_p}{S} )</td>
<td>3.7 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>A</td>
</tr>
</tbody>
</table>

### Design (N)

- Design LOS
- Required Number of Lanes, \( N \)

### Glossary

- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

### Design (N)

- Design LOS

### Operational (LOS)

\[
v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV} \times f_P)} \times 206 \quad \text{pc/h/ln}
\]

### Speed (mph)

- \( f_{LW} \)
- \( f_{LC} \)
- TRD Adjustment

### LOS and Performance Measures

- Design (N)

### Glossary

- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

### Design (N)

- Design LOS

### Glossary

- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

### Design (N)

- Design LOS

### Glossary

- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
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- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

### Design (N)

- Design LOS

### Glossary

- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
**BASIC FREEWAY SEGMENTS WORKSHEET**

<table>
<thead>
<tr>
<th><strong>General Information</strong></th>
<th><strong>Site Information</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
<tr>
<td>Highway/Direction of Travel</td>
<td>SR-47 Southbound</td>
</tr>
<tr>
<td>From/To</td>
<td>at Cdre. Schuyler Heim Bridge</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>No Federal Action (2026)</td>
</tr>
</tbody>
</table>

- Oper.(LOS)  
- Des.(N)  
- Planning Data

**Flow Inputs**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (963)</td>
<td>Peak-Hour Factor, PHF (0.94)</td>
</tr>
<tr>
<td>AADT (veh/day)</td>
<td>%Trucks and Buses, P_T (0)</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K (%)</td>
<td>%RVs, P_R (0)</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop. D (%)</td>
<td>Grade % Length mi</td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td>Up/Down</td>
</tr>
</tbody>
</table>

**Calculate Flow Adjustments**

\[
f_p = 1.00 \\
E_T = 1.5 \\
f_HV = \frac{1}{f_p^{1+P_T(E_T-1) + P_R(E_R-1)}}
\]

**Speed Inputs**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

**LOS and Performance Measures**

- Operational (LOS)
  \[
v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}^{341}} \text{ pc/h/ln} \times f_p\}
  \\
  S = 55.0 mph \\
  D = \frac{v_p}{S} 6.2 pc/mi/ln
  \\
  LOS A

- Design (N)
  \[
v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}^{341}} \text{ pc/h/ln} \times f_p\}
  \\
  S = \text{ mph} \\
  D = \frac{v_p}{S} 6.2 pc/mi/ln
  \\
  LOS A

- Required Number of Lanes, N

**Glossary**

- N: Number of lanes
- V: Hourly volume
- D: Density
- f_p: Flow rate
- FFS: Free-flow speed
- BFFS: Base free-flow speed
- DDHV: Directional design hour volume

- E_T: Exhibits 11-10, 11-12
- f_LW: Exhibit 11-8
- E_R: Exhibits 11-10, 11-11, 11-13
- f_LC: Exhibit 11-9
- f_p: Page 11-18
- TRD: Page 11-11
- LOS, S, FFS, v_p: Exhibits 11-2, 11-3

**Factor Location**

- E_T: Exhibits 11-10, 11-12
- f_LW: Exhibit 11-8
- E_R: Exhibits 11-10, 11-11, 11-13
- f_LC: Exhibit 11-9
- f_p: Page 11-18
- TRD: Page 11-11
- LOS, S, FFS, v_p: Exhibits 11-2, 11-3

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file:///C:/TEMP/f2k6C09.tmp
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

#### Site Information
- **Project Description**: YTI Project - Port of Los Angeles

#### Flow Inputs
- **Volume, V**: 2259 veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **Peak-Hr Prop. of AADT, K**: 0
- **Peak-Hr Direction Prop, D**: 0
- **AADT**: veh/day
- **%Trucks and Buses, P_T**: 0
- **General Terrain**: Level
- **Grade**: %
- **Length**: mi
- **Up/Down %**: 

#### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1+P_T(E_T - 1)} + P_T(E_T - 1) \) = 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Speed and Performance Measures
- **Calc Speed Adj and FFS**
- \( f_{LW} \)
- \( f_{LC} \)
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

#### LOS and Performance Measures
- **Operational (LOS)**
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \) = 1202 pc/h/ln
- **S**: 55.0 mph
- **D**: 21.9 pc/mi/ln
- **LOS**: C

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

#### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_{LW}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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*HCS 2010™ Version 6.50* Generated: 3/19/2014 6:09 PM
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information

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<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Highway/Direction of Travel</td>
<td>SR-47/Eastbound</td>
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<tr>
<td>From/To</td>
<td>at Vincent Thomas Bridge</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>No Federal Action (2026)</td>
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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

#### Site Information

- Oper.(LOS) [ ]
- Des.(N) [ ]
- Planning Data [ ]

#### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>2523 veh/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T 0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%RVs, P_R 0</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{(1 + P_T(E_T - 1) + P_R(E_R - 1))} \times 1.000 \)

#### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>2</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

#### Calc Speed Adj and FFS

- \( f_{LW} \) mph
- \( f_{LC} \) mph

#### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = \frac{(V \ or \ DDHV) \ / \ (PHF \times N \times f_{HV} \times f_p)}{1342} ) pc/h/ln</td>
<td>Design LOS</td>
</tr>
<tr>
<td>( S = 55.0 ) mph</td>
<td>( v_p = \frac{(V \ or \ DDHV) \ / \ (PHF \times N \times f_{HV} \times f_p)}{1342} ) pc/h/ln</td>
</tr>
<tr>
<td>( D = \frac{v_p}{S} ) pc/mi/ln</td>
<td>( S = 55.0 ) mph</td>
</tr>
<tr>
<td>LOS</td>
<td>( D = \frac{v_p}{S} ) pc/mi/ln</td>
</tr>
<tr>
<td>Required Number of Lanes, N</td>
<td></td>
</tr>
</tbody>
</table>

#### Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- \( v_p \) - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- BFFS - Base free-flow speed
- DDHV - Directional design hour volume

#### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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3/19/2014
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

## Site Information
- **Highway/Direction of Travel**: SR-91/Westbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

## Project Description
- **YTI Project - Port of Los Angeles**

## Flow Inputs
- **Volume, V**: 9841 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 6
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV x f_p)**
  - **S**: 63.3 mph
  - **D = v_p / S**: 27.6 pc/mi
  - **LOS**: D

## Glossary
- **N** - Number of lanes
- **V** - Hourly volume
- **v_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

## Factor Location
- **E_T - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_R - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
# BASIC FREEWAY WORKSHEET

## General Information

- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour

## Site Information

- **Highway/Direction of Travel:** SR-91/Eastbound
- **From/To:** East of Alameda St & Santa Fe
- **Jurisdiction:** CALTRANS
- **Analysis Year:** No Federal Action (2026)

---

## Flow Inputs

- **Volume, V:** 7829 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:** veh/h
- **DDHV = AADT x K x D:**

## Calculate Flow Adjustments

- **f_p:** 1.00
- **E_R:** 1.2
- **E_T:** 1.5
- **f_HV:** \( \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \) 1.000

## Speed Inputs

- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 6
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

## LOS and Performance Measures

- **Operational (LOS):**
- **Design (N):**

## Glossary

- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **V_p - Flow rate**
- **LOS - Level of service**
- **DDHV - Directional design hour volume**

---

**Factors Location**

- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Jurisdiction**: CALTRANS
- **Site Information**: Highway/Direction of Travel I-110/Northbound
- **From/To**: South of C St
- **Analysis Year**: No Federal Action (2016)

#### Flow Inputs
- **Volume, V**: 3136 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/(1+P_T(E_T-1) + P_R(E_R-1))**: 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**: pc/h/ln
  - **S**: 65.0 mph
  - **D = v_p / S**: pc/mi/ln
  - **LOS**: B

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

---

**Flow Inputs**

- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0

**Speed Inputs**

- **f_LW**: mph
- **f_LC**: mph

**LOS and Performance Measures**

- **Design (N)**
  - **Design LOS**: pc/h/ln
  - **D = v_p / S**: pc/mi/ln

**Glossary**

- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

## Site Information
- **Highway/Direction of Travel**: I-110/Southbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action Alt (2026)

## Project Description
- **YTI Project - Port of Los Angeles**

## Flow Inputs
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>4582 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>942 veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T 0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%RVs, P_R 0</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{f_p(1 + E_T) + P_R(E_R - 1)} \) 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi

## Calc Speed Adj and FFS
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

### Operational (LOS)
- \( v_p = \frac{(V \text{ or DDHV}) \times f_{HV}}{(PHF \times N \times f_p)} \) pc/h/ln
- \( S = 65.0 \text{ mph} \)
- \( D = \frac{v_p}{S} \) pc/mi/ln
- **LOS**: C

### Design (N)
- **Design LOS**: Design (N)
- **Design LOS**: Design (N)

## Glossary
- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- **LOS**: Level of service
- DDHV - Directional design hour volume
- BFFS - Base free-flow speed

## Factor Location
- \( E_R = \text{Exhibits 11-10, 11-12} \)
- \( f_{LV} = \text{Exhibit 11-8} \)
- \( E_T = \text{Exhibits 11-10, 11-11, 11-13} \)
- \( f_{LC} = \text{Exhibit 11-9} \)
- \( f_p = \text{Page 11-18} \)
- \( \text{TRD} = \text{Page 11-11} \)
- \( \text{LOS, S, FFS, } v_p = \text{Exhibits 11-2, 11-3} \)

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
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<tr>
<th>Analyst</th>
<th>RA</th>
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<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-405/Northbound |
| From/To | At Santa Fe Av |
| Jurisdiction | CALTRANS |
| Analysis Year | No Federal Action (2026) |

## Flow Inputs

| Volume, V | 9238 veh/h |
| AADT | 156 veh/day |
| Peak-Hr Prop. of AADT, K | % RVs, P_R |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | Grade % Length mi |

## Calculate Flow Adjustments

- \( E_R \) = \( E_T \) = 1.2
- \( E_T \) = 1.5
- \( f_{HV} = 1/(1+P_T(E_T-1)+P_R(E_R-1)) \)

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/\( mi \) |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## LOS and Performance Measures

| Operational (LOS) | Design (N) |
| \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p) \) | \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p) \) |
| S | pc/h/\( ln \) |
| D | pc/\( mi/ln \) |

## Glossary

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

## Factor Location

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- Generated: 3/19/2014 6:29 PM
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

### Site Information

| Highway/Direction of Travel | I-405/Southbound |
| From/To | At Santa Fe Av |
| Jurisdiction | CALTRANS |
| Analysis Year | No Federal Action Alt (2026) |

### Flow Inputs

| Volume, V | 11313 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %RVs, P_R |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | veh/h Grade % Length mi |

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{f_p + P_T (E_T - 1) + P_R (E_R - 1)} = 1.000 \)

### Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

### Calc Speed Adj and FFS

- \( f_{LW} \)
- \( f_{LC} \)
- TRD Adjustment
- FFS

### LOS and Performance Measures

| Operational (LOS) | Design (N) |
| \( v_p = \frac{(V \ or \ DDHV) \ / \ (PHF \ x \ N \ x \ f_{HV} \ x \ f_p)}{S} \ = 2407 \ pc/h/ln | Design LOS |
| S | 50.6 mph |
| D = \( \frac{v_p}{S} \) | 47.5 pc/mi/ln |
| LOS | F |
| Required Number of Lanes, N |

### Glossary

- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

- E_R - Exhibits 11-10, 11-12
- f_{HV} - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_{LC} - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: At Alondra Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

#### Flow Inputs
- **Volume, V**: 8772 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV**: AADT x K x D veh/h

#### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1+[P_T(E_T - 1) + P_R(E_R - 1)]} = 1.000 \)

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \)
  - \( S = 1866 \text{ pc/h/ln} \)
  - \( D = 61.9 \text{ mph} \)
  - \( D = v_p / S \)

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **D**: Density
- **LOS**: Level of service

#### Factor Location
- \( E_R - \text{Exhibits 11-10, 11-12} \)
- \( f_{LV} - \text{Exhibit } 11-8 \)
- \( E_T - \text{Exhibits 11-10, 11-11, 11-13} \)
- \( f_{LC} - \text{Exhibit } 11-9 \)
- \( f_p - \text{Page 11-18} \)
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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# BASIC FREEWAY WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: At Alondra Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action Alt (2026)

## Flow Inputs
- **Volume, V**: 7826 veh/h
- **AADT**: veh/day
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **Peak-Hr Prop. of AADT, K**:
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **f_HV** = \( \frac{1}{(1+P_T(E_T - 1) + P_R(E_R - 1))} \) 1.00

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## Speed Inputs
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

## LOS and Performance Measures
- **Design (N)**
- **Operational (LOS)**

## Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **V_p** - Flow rate
- **LOS** - Level of service
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume

## Factor Location
- **E_R** - Exhibits 11-10, 11-12
- **f_LW** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_LC** - Exhibit 11-9
- **f_p** - Page 11-18
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3

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3/19/2014
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<th>Site Information</th>
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<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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<tr>
<td></td>
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</table>

**Flow Inputs**

- **Volume, V** 7712 veh/h
- **AADT** veh/day
- **Peak-Hr Prop. of AADT, K**
- **Peak-Hr Direction Prop, D** veh/h
- **DDHV = AADT x K x D**

**Calculate Flow Adjustments**

<table>
<thead>
<tr>
<th>f_p</th>
<th>1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**Flow Inputs**

- **Peak-Hour Factor, PHF** 0.94
- **%Trucks and Buses, P_T** 0
- **%RVs, P_R** 0
- **General Terrain:** Level
- **Grade %**
- **Length mi**

**Flow Inputs**

- **Up/Down %**

**Speed Inputs**

- **Lane Width** ft
- **Rt-Side Lat. Clearance** ft
- **Number of Lanes, N** 4
- **Total Ramp Density, TRD** ramps/mi
- **FFS (measured)** 55.0 mph
- **Base free-flow Speed, BFFS** mph

**Calculate Speed Adj and FFS**

- **f_LW** mph
- **f_LC** mph
- **TRD Adjustment** mph
- **FFS** 55.0 mph

**LOS and Performance Measures**

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_hv x f_p)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>S</td>
<td>Design N</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>E</td>
<td>pc/h/ln</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor Location</th>
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</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
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<td>f_LW</td>
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<tr>
<td>f_LC</td>
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<tr>
<td>f_p</td>
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<tr>
<td>TRD</td>
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<tr>
<td>LOS, S, FFS, v_p</td>
</tr>
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</tbody>
</table>

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### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between I-405 & Del Amo
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

### Flow Inputs
- **Volume, V**: 7041 veh/h
- **AADT**: 7041 veh/day
- **Peak-Hr Prop. of AADT, K**:%
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: %Trucks and Buses, P

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **f_HV = 1/[E_T + P_T (E_T - 1) + P_R (E_R - 1)]**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  
\[
\begin{align*}
V_p &= \left( V \times DDHV \right) / \left( PHF \times N \times f_HV \right) \\
S &= 54.9 \text{ mph} \\
D &= v_p / S \\
DOS &= D
\end{align*}
\]

- **Design (N)**
  
\[
\begin{align*}
V_p &= \left( V \times DDHV \right) / \left( PHF \times N \times f_HV \right) \\
S &= 54.9 \text{ mph} \\
D &= v_p / S \\
LOS &= D
\end{align*}
\]

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **E_T**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
### BASIC FREEWAY SECTIONS WORKSHEET

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** Between PCH & Willow St
- **Jurisdiction:** CALTRANS
- **Analysis Year:** No Federal Action Alt (2026)

#### Flow Inputs
- **Volume, V:** 5725 veh/h
- **AADT:** 5725 veh/day
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, P_T:** 0
- **%RVs, P_R:** 0
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:**
- **veh/h**

#### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_R:** 1.2
- **E_T:** 1.5
- **f_HV = \frac{1}{(1 + P_T)(E_T - 1) + P_R(E_R - 1)} = 1.000**

#### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 3
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:** mph

#### LOS and Performance Measures
- **Operational (LOS):**
  \[ v_p = \frac{(V \text{ or } DDHV) \times f_{HV}}{(PHF \times N \times f_p)} \]
  \[ 2030 \text{ pc/h/ln} \]
- **Design (N):**
  \[ v_p = \frac{(V \text{ or } DDHV) \times f_{HV}}{(PHF \times N \times f_p)} \]
  \[ \text{ Design LOS } \]
- **S:** 53.7 mph
- **D:** \[ \frac{37.8 \text{ pc/mi/ln}}{E} \]

#### Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **f_p:** Flow rate
- **FFS:** Free-flow speed
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between PCH & Willow St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

### Flow Inputs
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<tr>
<th>Description</th>
<th>Value</th>
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<tr>
<td>Volume, V</td>
<td>6165 veh/h</td>
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<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%RVs, P_R</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \]

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS
<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_LW</td>
<td>mph</td>
</tr>
<tr>
<td>f_LC</td>
<td>mph</td>
</tr>
<tr>
<td>TRD Adjustment</td>
<td>mph</td>
</tr>
<tr>
<td>FFS</td>
<td>55.0 mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

**Operational (LOS)**
\[ v_p = \frac{(V \text{ or DDHV}) \times f_{HV}}{(PHF \times N \times f_{HV}^2)} \]
\[ S = \frac{v_p}{D} \]
\[ E = \frac{v_p}{D} \]

**Design (N)**
\[ v_p = \frac{(V \text{ or DDHV}) \times f_{HV}}{(PHF \times N \times f_{HV}^2)} \]
\[ S = \frac{v_p}{D} \]

**Required Number of Lanes, N**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **D**: Density
- **f_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

**Factor Location**
- **E_R - Exhibits 11-10, 11-12**: f_{LV} - Exhibit 11-8
- **E_T - Exhibits 11-11, 11-13**: f_{LC} - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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<td>Raju Associates</td>
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<tr>
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<td>PM Peak Hour</td>
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<tr>
<td>Highway/Direction of Travel</td>
<td>I-710/Northbound</td>
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<th><strong>Flow Inputs</strong></th>
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<tbody>
<tr>
<td>Volume, V</td>
<td>7264 veh/h</td>
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<tr>
<td>AADT</td>
<td>veh/day</td>
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<td>Peak-Hr Prop. of AADT, K</td>
<td>%RVs, P_R</td>
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<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain:</td>
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<tr>
<td>DDHV = AADT x K x D</td>
<td>Level</td>
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<thead>
<tr>
<th><strong>Calculate Flow Adjustments</strong></th>
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<tbody>
<tr>
<td>f_p</td>
<td>1.00</td>
</tr>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
<tr>
<td>E_R</td>
<td>1.2</td>
</tr>
<tr>
<td>E_HV = 1/(1+P_T(E_T - 1) + P_R(E_R - 1)]</td>
<td>1.000</td>
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<table>
<thead>
<tr>
<th><strong>Speed Inputs</strong></th>
<th><strong>Calc Speed Adj and FFS</strong></th>
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<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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<table>
<thead>
<tr>
<th><strong>LOS and Performance Measures</strong></th>
<th><strong>Design (N)</strong></th>
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<tbody>
<tr>
<td>Operational (LOS)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
</tr>
<tr>
<td>S</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>pc/mi/ln</td>
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<tr>
<td>LOS</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th><strong>Glossary</strong></th>
<th><strong>Factor Location</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
<td>S - Speed</td>
</tr>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td>E_R - Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>E_T - Exhibits 11-10, 11-11, 11-13</td>
<td></td>
</tr>
<tr>
<td>f_p - Page 11-18</td>
<td></td>
</tr>
<tr>
<td>TRD - Page 11-11</td>
<td></td>
</tr>
<tr>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
<td></td>
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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

### Flow Inputs
- **Volume, V**: 8127 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_{HV} = 1/(1+P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV})**: pc/h/ln
  - **S**: 56.8 mph
  - **D = v_p / S**: pc/mi/ln
- **LOS E**

### Glossary
- **N** - Number of lanes
- **V** - Hourly volume
- **v_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

### Design (N)
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV})**: pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
- **Required Number of Lanes, N**

### Factor Location
- **E_R** - Exhibits 11-10, 11-12
- **f_{LVW}** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
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<td>Agency or Company</td>
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<tr>
<td>Date Performed</td>
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### Site Information

<table>
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<tr>
<th>Highway/Direction of Travel</th>
<th>I-710/Northbound</th>
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<tbody>
<tr>
<td>From/To</td>
<td>n/o I-105 and n/o Firestone</td>
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### Flow Inputs

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<thead>
<tr>
<th>Volume, V (veh/h)</th>
<th>8003</th>
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<tr>
<td>AADT (veh/day)</td>
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<td>Peak-Hr Prop. of AADT, K</td>
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</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
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<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
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### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Flow Adjustment</th>
<th>Calculation</th>
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<td>1.00</td>
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<tr>
<td>E_T</td>
<td>1.5</td>
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<tr>
<td>E_R</td>
<td>1.2</td>
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### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
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<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
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<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
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<tr>
<td>Base free-flow speed, BFFS</td>
<td>mph</td>
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### Calc Speed Adj and FFS

<table>
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<tr>
<th>TRD Adjustment</th>
<th>mph</th>
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<tbody>
<tr>
<td>FFS</td>
<td>65.0 mph</td>
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### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
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</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_rV) x f_p</td>
<td>v_p = (V or DDHV) / (PHF x N x f_rV) x f_p</td>
</tr>
<tr>
<td>S</td>
<td>57.5 mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>37.0 pc/mi</td>
</tr>
<tr>
<td>LOS</td>
<td>E</td>
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</tbody>
</table>

### Glossary

- N - Number of lanes
- V - Hourly volume
- f_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location

- E_R - Exhibits 11-10, 11-12
- f_p - Page 11-18
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<tr>
<td>Date Performed</td>
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<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
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<td>Site Information</td>
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<tr>
<td>Highway/Direction of Travel</td>
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<tr>
<td>From/To</td>
<td>n/o I-105 &amp; n/o Firestone</td>
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<td>Jurisdiction</td>
<td>CALTRANS</td>
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<tr>
<td>Analysis Year</td>
<td>No Federal Action (2026)</td>
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## Project Description

YTI Project - Port of Los Angeles

## Flow Inputs

| Volume, V | 8745 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | 
| DDHV = AADT x K x D | veh/h |

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{(1 + P_T) + P_R} \times 1.000 \)

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
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<tr>
<td>( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p )</td>
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<tr>
<td>S = 52.8 mph</td>
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<tr>
<td>D = ( v_p / S )</td>
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<td>LOS = E</td>
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### Design (N)

<table>
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<td>( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p )</td>
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<tr>
<td>S = mph</td>
</tr>
<tr>
<td>D = ( v_p / S )</td>
</tr>
<tr>
<td>Required Number of Lanes, N</td>
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## Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{HW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
**BASIC FREEWAY SEGMENTS WORKSHEET**

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<td>Highways/Direction of Travel</td>
<td>SR-47 Northbound at Cдрв. Schuyler Heim Bridge</td>
<td>PM Peak Hour</td>
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<td>PM Peak Hour</td>
<td>YTI Project - Port of Los Angeles</td>
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<th>Agency or Company</th>
<th>Date Performed</th>
<th>Analysis Time Period</th>
<th>Project Description</th>
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<td>Raju Associates</td>
<td>8/6/2013</td>
<td>PM Peak Hour</td>
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<td>PM Peak Hour</td>
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<td>PM Peak Hour</td>
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<th>Project Description</th>
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<td>PM Peak Hour</td>
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<td>8/6/2013</td>
<td>PM Peak Hour</td>
<td>YTI Project - Port of Los Angeles</td>
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### Flow Inputs

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
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<tr>
<td>Volume, V</td>
<td>1066 veh/h</td>
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<td>AADT</td>
<td>veh/day</td>
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<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%RVs, P_R</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{f_p}{E_T} = 0.66 \)

### Speed Inputs

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td>Design (N)</td>
</tr>
<tr>
<td>( v_p = \frac{(V \text{ or DDHV}) \times f_p}{PHF \times N} )</td>
<td>( v_p = \frac{(V \text{ or DDHV}) \times f_p}{PHF \times N} )</td>
</tr>
<tr>
<td>S</td>
<td>55.0 mph</td>
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<tr>
<td>D = ( \frac{v_p}{S} )</td>
<td>6.9 pc/mi/ln</td>
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<td>LOS</td>
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### Glossary

- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location

- **E_R**: Exhibits 11-10, 11-12
- **f_{LW}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

#### Site Information
- **Highway/Direction of Travel**: SR-47 Southbound
- **From/To**: at Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

#### Project Description
- **YTI Project - Port of Los Angeles**

#### Flow Inputs
- **Volume, V**: 821 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

<table>
<thead>
<tr>
<th>Flow Inputs</th>
<th>Value</th>
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<tbody>
<tr>
<td>Volume, V</td>
<td>821</td>
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<tr>
<td>AADT</td>
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<tr>
<td>Peak-Hr Prop. of AADT, K</td>
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</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments
- **$f_p$**: 1.00
- **$E_T$**: 1.5
- **$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)] $**: 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Design (N)
- **Operational (LOS)**
- **S**: 55.0 mph
- **D**: 5.3 pc/mi
- **LOS**: A

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **$V_p$**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Glossary
- **$E_T$ - Exhibits 11-10, 11-12**
- **$E_R$ - Exhibits 11-10, 11-11, 11-13**
- **$f_{LC}$**: Exhibit 11-9
- **$f_p$**: Page 11-18
- **LOS, S, FFS, $v_p$**: Exhibits 11-2, 11-3

### Factor Location
- **$E_T$**: Exhibits 11-10, 11-11, 11-13
- **$f_{LC}$**: Exhibit 11-9
- **$f_p$**: Page 11-18
- **TRD**: Page 11-11

---

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Generated: 3/19/2014 6:34 PM
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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<tbody>
<tr>
<td>Analyst</td>
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</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
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</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
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<td>YTI Project - Port of Los Angeles</td>
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### Site Information

<table>
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<tr>
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<tbody>
<tr>
<td>Highway/Direction of Travel</td>
<td>SR-47/Eastbound</td>
</tr>
<tr>
<td>From/To</td>
<td>at Vincent Thomas Bridge</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>No Federal Action (2026)</td>
</tr>
</tbody>
</table>

### Flow Inputs

<table>
<thead>
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<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>2698 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain: Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>Grade % Length mi</td>
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### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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<tbody>
<tr>
<td>f_p</td>
<td>1.00</td>
</tr>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
<tr>
<td>E_R</td>
<td>1.2</td>
</tr>
</tbody>
</table>
| f_HV                         | $f_{HV} = \frac{1}{\frac{1}{f_p} + P_T(E_T - 1)} + P_R(E_R - 1)] 1.000$

### Speed Inputs

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>2</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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</table>

### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>Field</th>
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<tbody>
<tr>
<td>f_LW</td>
<td>mph</td>
</tr>
<tr>
<td>f_LC</td>
<td>mph</td>
</tr>
<tr>
<td>TRD Adjustment</td>
<td>mph</td>
</tr>
<tr>
<td>FFS</td>
<td>55.0 mph</td>
</tr>
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### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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<tbody>
<tr>
<td>Operational (LOS)</td>
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<tr>
<td>Design (N)</td>
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### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>v_p</td>
<td>Flow rate</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
</tr>
<tr>
<td>DDHV</td>
<td>Directional design hour volume</td>
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</table>

### Factor Location

<table>
<thead>
<tr>
<th>Term</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>E_R</td>
<td>Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>f_LW</td>
<td>Exhibit 11-8</td>
</tr>
<tr>
<td>E_T</td>
<td>Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>f_LC</td>
<td>Exhibit 11-9</td>
</tr>
<tr>
<td>p</td>
<td>Page 11-18</td>
</tr>
<tr>
<td>LOS, S, FFS, v_p</td>
<td>Exhibits 11-2, 11-3</td>
</tr>
</tbody>
</table>
**BASIC FREEWAY SEGMENTS WORKSHEET**

<table>
<thead>
<tr>
<th>General Information</th>
<th>Site Information</th>
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<tbody>
<tr>
<td>Analyst</td>
<td>Highway/Direction of Travel</td>
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<tr>
<td>RA</td>
<td>SR-47/Westbound</td>
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<tr>
<td>Agency or Company</td>
<td>From/To</td>
</tr>
<tr>
<td>Raju Associates</td>
<td>at Vincent Thomas Bridge</td>
</tr>
<tr>
<td>Date Performed</td>
<td>Jurisdiction</td>
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<tr>
<td>8/6/2013</td>
<td>CALTRANS</td>
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<tr>
<td>Analysis Time Period</td>
<td>Analysis Year</td>
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<td>PM Peak Hour</td>
<td>No Federal Action (2026)</td>
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<tr>
<td>Project Description</td>
<td></td>
</tr>
<tr>
<td>YTI Project - Port of Los Angeles</td>
<td></td>
</tr>
<tr>
<td>☑ Oper.(LOS)</td>
<td></td>
</tr>
<tr>
<td>□ Des.(N)</td>
<td></td>
</tr>
<tr>
<td>□ Planning Data</td>
<td></td>
</tr>
</tbody>
</table>

**Flow Inputs**

- **Volume, V**: 3050 veh/h
- **AADT**: 3050 veh/day
- **Peak-Hr Prop. of AADT, K**: 0%
- **Peak-Hr Direction Prop, D**: 0%
- **DDHV = AADT x K x D**: 3050 veh/h

**Calculate Flow Adjustments**

- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = 1/(1 + E_T(E_P - 1) + P_E(E_R - 1))**: 1.000

**Speed Inputs**

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

**Calc Speed Adj and FFS**

- **f_{LW}**: mph
- **f_{LC}**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

**LOS and Performance Measures**

**Operational (LOS)**

- **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)**: 1622 pc/h/ln
- **S**: 55.0 mph
- **D = v_p / S**: 29.5 pc/mi/ln
- **LOS**: D

**Required Number of Lanes, N**

**Glossary**

- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

**Factor Location**

- **E_R**: Exhibits 11-10, 11-12
- **f_{LW}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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file:///C:/TEMP/f2k9F2.tmp 3/19/2014
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: SR-91/Eastbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

## Site Information

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Site Information</td>
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</tr>
<tr>
<td>$QDO\V</td>
<td></td>
</tr>
<tr>
<td>WRA</td>
<td></td>
</tr>
<tr>
<td>$URP7R</td>
<td></td>
</tr>
<tr>
<td>East of Alameda St &amp; Santa Fe</td>
<td></td>
</tr>
<tr>
<td>Project - Port of Los Angeles</td>
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</table>

## Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Volume, V</td>
<td>9129 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td></td>
</tr>
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</table>

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E_R$</td>
<td>1.2</td>
</tr>
<tr>
<td>$E_T$</td>
<td>1.5</td>
</tr>
<tr>
<td>$f_{HV}$</td>
<td>1.00</td>
</tr>
</tbody>
</table>

### Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>6</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
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</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v_p$</td>
<td></td>
</tr>
<tr>
<td>$S$</td>
<td>64.3 mph</td>
</tr>
<tr>
<td>$D$</td>
<td>25.2 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>C</td>
</tr>
</tbody>
</table>

### Glossary
- N - Number of lanes
- V - Hourly volume
- $v_p$ - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

## Factor Location

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>$E_R$</td>
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</tr>
<tr>
<td>$E_T$</td>
<td>Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>$f_{HV}$</td>
<td>Exhibit 11-8</td>
</tr>
<tr>
<td>$f_{LVW}$</td>
<td>Exhibit 11-9</td>
</tr>
<tr>
<td>$f_{LC}$</td>
<td>Exhibit 11-9</td>
</tr>
<tr>
<td>$f_p$</td>
<td>Page 11-18</td>
</tr>
<tr>
<td>TRD</td>
<td>Page 11-11</td>
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<tr>
<td>LOS, S, FFS, $v_p$</td>
<td>Exhibits 11-2, 11-3</td>
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3/19/2014
# BASIC FREEWAY WORKSHEET

## General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: PM Peak Hour

## Site Information
- Highway/Direction of Travel: SR-91/Eastbound
- From/To: East of Alameda St & Santa Fe
- Jurisdiction: CALTRANS
- Analysis Year: No Federal Action Alt (2026)

## Project Description
- YTI Project - Port of Los Angeles

## Flow Inputs
- Volume, V: 9129 veh/h
- AADT: veh/day
- Peak-Hr Prop. of AADT, K: %Trucks and Buses, P_T
- Peak-Hr Direction Prop, D: %RVs, P_R
- DDHV = AADT x K x D: veh/h

## Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \cdot 1.000 \)

## Speed Inputs
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 6
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 65.0 mph
- Base free-flow Speed, BFFS: mph

## Calc Speed Adj and FFS
- \( f_{LV} \) mph
- \( f_{LC} \) mph
- TRD Adjustment: mph
- FFS: 65.0 mph

## LOS and Performance Measures
- Operational (LOS): 
  \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{RV})} \times f_p \)
  \[1619\]
  \( s = \frac{64.3}{\text{mph}} \)
  \( d = \frac{v_p}{s} \)
  \( 25.2 \text{ pc/mi/ln} \)
  \( C \)

## Design (N)
- Design LOS
  \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{RV})} \times f_p \)
  \( s \) mph
  \( d = \frac{v_p}{s} \)
  \( \text{pc/mi/ln} \)
- Required Number of Lanes, N

## Glossary
- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- FFS - Free-flow speed
- BFFS - Base free-flow speed

## Factor Location
- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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3/19/2014
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: SR-91/Westbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: No Federal Action (2026)

### Flow Inputs
- **Volume, V**: 7082 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{f_p[1 + P_T(E_T - 1) + P_R(E_R - 1)]} \) 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 6
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times x f_{HV} \times f_p)} \)
  - \( x_{f_p} = 1256 \) pc/h/ln
  - \( S = 65.0 \) mph
  - \( D = v_p / S = 19.3 \) pc/mi/ln
  - **LOS C**

### Design (N)
- **Design (N)**
  - **Design LOS**: \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times x f_{HV} \times f_p)} \)
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **Required Number of Lanes, N**

### Glossary
- **N** - Number of lanes
- **V** - Hourly volume
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_{LV} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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REDUCED PROJECT (2026) – ALTERNATIVE 3
(IMPROVE BERTHS 217-220 ONLY)

AM/PM PEAK HOURS
### Basic Freeway Segments Worksheet

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

#### Site Information
- **Highway/Direction of Travel**: I-110/Northbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

#### Project Description
- **YTI Project - Port of Los Angeles**
- **Oper.(LOS)**
- **Des.(N)**
- **Planning Data**

#### Flow Inputs
- **Volume, V**: 4651 veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **Peak-Hr Prop. of AADT, k**: 0%
- **Peak-Hr Direction Prop, D**: Level
- **AADT**: veh/day
- **%Trucks and Buses, P_T**: 0
- **Peak-Hr Direction Prop, D**: Level
- **DDHV = AADT x K x D**: veh/h
- **Grade %**:
- **Length mi**:
- **Up/Down %**

#### Calculate Flow Adjustments
- \( f_p \) = 1.00
- \( E_R \) = 1.2
- \( E_T \) = 1.5
- \( f_{HV} = 1/\{1 + P_T(E_T - 1) + P_R(E_R - 1)\} \)

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Speed Adj and FFS
- **Calc Speed Adj**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

#### LOS and Performance Measures
- **Operation (LOS)**
- **LOS**: Design (N)

#### Design (N)
- **Design LOS**
- **Required Number of Lanes, N**

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **f_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

---

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### General Information
- **Analyzer**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Site Information**: Highway/Direction of Travel I-110/Southbound
  - From/To: South of C St
  - Jurisdiction: CALTRANS
  - Analysis Year: Reduced Project (2026)

### Flow Inputs
- **Volume, V**: 3324 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**:%
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p = 1.00**
- **E_T = 1.5**
  - \( E_HV = \frac{1}{1 + f_p (E_T - 1) + P_R (E_R - 1)} \) = 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS
- **f_{LW}**: mph
- **f_{LC}**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV) / (PHF \times N \times f_hv)}{f_p} \) pc/h/ln
  - \( S = 65.0 \) mph
  - \( D = v_p / S \) pc/mi/ln
- **LOS**: B

### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **f_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

---

**Design (N)**

- **Design LOS**
  - \( v_p = \frac{(V \text{ or } DDHV) / (PHF \times N \times f_hv)}{f_p} \) pc/h/ln
  - \( S = 65.0 \) mph
  - \( D = v_p / S \) pc/mi/ln

- **Required Number of Lanes, N**

---

**Factor Location**

- **E_R - Exhibits**: 11-10, 11-12
- **f_{LW} - Exhibit**: 11-8
- **E_T - Exhibits**: 11-10, 11-11, 11-13
- **f_{LC} - Exhibit**: 11-9
- **f_p - Page**: 11-18
- **TRD - Page**: 11-11
- **LOS, S, FFS, v_p - Exhibits**: 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-405/Northbound
- **From/To**: At Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

#### Flow Inputs
- **Volume, V**: 11854 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain:
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_{HV} = \frac{1}{1+E_R(1-E_T-1)} + \frac{1}{1+E_T(1-E_R-1)}**: 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV})}**: 2522 pc/h/ln
  - **S**: 47.1 mph
  - **D = \frac{v_p}{S}**: 53.5 pc/mi/ln
  - **LOS**: F

- **Design (N)**
  - **Design LOS**
  - **D = \frac{v_p}{S}**: pc/mi/ln

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

#### Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_{LVW} - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_{LC} - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-405/Southbound
- **From/To**: At Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

### Flow Inputs
- **Volume, V**: 7526 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = \frac{1}{(1+P_T)(E_T - 1) + P_R(E_R - 1)}**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = \frac{(V or DDHV) \times f_p}{PHF \times N \times f_{HV}}**: pc/h/ln
  - **S**: 64.4 mph
  - **D = \frac{v_p}{S}**: pc/mi/ln
  - **LOS**: C

### Design (N)
- **Design LOS**
  - **v_p = \frac{(V or DDHV) \times f_p}{PHF \times N \times f_{HV}}**: pc/h/ln
  - **S**: mph
  - **D = \frac{v_p}{S}**: pc/mi/ln
  - **Required Number of Lanes, N**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

### Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_{LV}
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_{LC}
- **f_p - Page 11-18**: TRD
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information

<table>
<thead>
<tr>
<th><strong>Analyst</strong></th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agency or Company</strong></td>
<td>Raju Associates</td>
</tr>
<tr>
<td><strong>Date Performed</strong></td>
<td>8/6/2013</td>
</tr>
<tr>
<td><strong>Analysis Time Period</strong></td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td><strong>Project Description</strong></td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

### Site Information

| **Highway/Direction of Travel** | I-710/Northbound |
| **From/To** | Alondra Bl |
| **Jurisdiction** | CALTRANS |
| **Analysis Year** | Reduced Project (2026) |

### Flow Inputs

| **Volume, V** | 7687 veh/h |
| **AADT** | veh/day |
| **Peak-Hr Prop. of AADT, K** | % |
| **Peak-Hr Direction Prop, D** | % |
| **DDHV = AADT x K x D** | veh/h |

### Calculate Flow Adjustments

| **f_p** | 1.00 |
| **E_T** | 1.5 |
| **E_R** | 1.2 |

### Speed Inputs

| **Lane Width** | ft |
| **Rt-Side Lat. Clearance** | ft |
| **Number of Lanes, N** | 5 |
| **Total Ramp Density, TRD** | ramps/mi |
| **FFS (measured)** | 65.0 mph |

### Calc Speed Adj and FFS

| **f_LW** | mph |
| **f_LC** | mph |

### LOS and Performance Measures

| **Operational (LOS)** | Design (N) |
| **v_p \(= (V \text{ or DDHV) / (PHF x N x f_{HV} x f_p})\)** | Design LOS |
| **S** | 64.2 mph |
| **D = v_p / S** | 25.5 pc/mi/ln |
| **LOS** | C |

### Glossary

| **N** - Number of lanes | **S** - Speed |
| **V** - Hourly volume | **D** - Density |
| **v_p** - Flow rate | **FFS** - Free-flow speed |
| **LOS** - Level of service | **BFFS** - Base free-flow speed |
| **DDHV** - Directional design hour volume | **E_R** - Exhibits 11-10, 11-12 |

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**General Information**
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: AM Peak Hour
- Project Description: YTI Project - Port of Los Angeles

**Flow Inputs**
- Volume, V: 9931 veh/h
- AADT: veh/day
- Peak-Hr Prop. of AADT, K:
- Peak-Hr Direction Prop, D:
- DDHV = AADT x K x D: veh/h

**Calculate Flow Adjustments**
- \( f_p \) = 1.00
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{f_p + (E_T - 1) E_R} \)
- \( f_{HV} = 1.000 \)

**Speed Inputs**
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 5
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 65.0 mph
- Base free-flow Speed, BFFS: mph

**LOS and Performance Measures**
- Operational (LOS)
  - \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p^2) \)
  - \( S = 57.8 \) mph
  - \( D = v_p / S \)
  - LOS
- Design (N)
  - Design LOS
  - Required Number of Lanes, N

**Glossary**
- N: Number of lanes
- V: Hourly volume
- \( v_p \): Flow rate
- LOS: Level of service
- DDHV: Directional design hour volume

**Factor Location**
- \( E_R \): Exhibits 11-10, 11-12
- \( f_{LV} \): Exhibit 11-8
- \( E_T \): Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \): Exhibit 11-9
- \( f_p \): Page 11-18
- TRD: Page 11-11
- LOS, S, FFS, \( v_p \): Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** Between I-405 & Del Amo
- **Jurisdiction:** CALTRANS
- **Analysis Year:** Reduced Project (2026)

## Site Information

## Flow Inputs
- **Volume, V:** 7195 veh/h
- **AADT:** veh/day
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, P_T:** 0
- **%RVs, P_R:** 0
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h
- **Grade:** %
- **Length:** mi

## Calculate Flow Adjustments
- **f_p:** 1.00
- **E_T:** 1.5
- **f_HV = 1/f([1 + P_T(E_T - 1) + P_R(E_R - 1)] 1.000)

## Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:** mph

## Calc Speed Adj and FFS
- **f_LW:** mph
- **f_LC:** mph
- **TRD Adjustment:** mph
- **FFS:** mph

## LOS and Performance Measures
- **Operational (LOS):**
- **Design (N):**
- **Design LOS**

## Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **f_p:** Flow rate
- **FFS:** Free-flow speed
- **LOS:** Level of service
- **BFFS:** Base free-flow speed
- **DDHV:** Directional design hour volume

## Factor Location
- **E_R:** Exhibits 11-10, 11-12
- **f_LW:** Exhibit 11-8
- **E_T:** Exhibits 11-10, 11-11, 11-13
- **f_LC:** Exhibit 11-9
- **f_p:** Page 11-18
- **TRD:** Page 11-11
- **LOS, S, FFS, v_p:** Exhibits 11-2, 11-3

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour

#### Site Information
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** Between I-405 & Del Amo
- **Jurisdiction:** CALTRANS
- **Analysis Year:** Reduced Project (2026)

#### Project Description
- **YTI Project - Port of Los Angeles**
- **Oper.(LOS)**
- **Des.(N)**
- **Planning Data**

### Flow Inputs

| Volume, V | 8115 | veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT | veh/day | %Trucks and Buses, P_T | 0 |
| Peak-Hr Prop. of AADT, K | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D | General Terrain: | Level |
| DDHV = AADT x K x D | veh/h | Grade % | Length mi |
| | | Up/Down % |

#### Calculate Flow Adjustments

\[ f_p = 1.00 \quad E_T = 1.5 \quad f_{HV} = \frac{1}{\phi[1 + P_T(E_T - 1)]} \]

#### Speed Inputs

| Lane Width | ft | f_LW |
| Rt-Side Lat. Clearance | ft | f_LC |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi | TRD Adjustment |
| FFS (measured) | 55.0 mph |
| Base free-flow Speed, BFFS | mph |

#### Speed Adj and FFS

<table>
<thead>
<tr>
<th>Calc Speed Adj and FFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance ft</td>
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<tr>
<td>Number of Lanes, N 4</td>
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<tr>
<td>Total Ramp Density, TRD</td>
</tr>
<tr>
<td>FFS (measured) 55.0 mph</td>
</tr>
<tr>
<td>BFFS mph</td>
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#### LOS and Performance Measures

<table>
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<tr>
<th>Operational (LOS)</th>
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<tbody>
<tr>
<td>( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV}} \times f_p) )</td>
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<tr>
<td>S</td>
</tr>
<tr>
<td>( S )</td>
</tr>
<tr>
<td>( D = \frac{v_p}{S} )</td>
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<td>LOS</td>
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#### Design (N)

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<td>Design LOS</td>
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<tr>
<td>( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV}} \times f_p) ) pc/h/ln</td>
</tr>
<tr>
<td>S mph</td>
</tr>
<tr>
<td>( D = \frac{v_p}{S} ) pc/mi/ln</td>
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</table>

#### Required Number of Lanes, N

### Glossary

- **N** - Number of lanes
- **V** - Hourly volume
- **D** - Density
- **v_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume
- **FFS** - Free-flow speed
- **BFFS** - Base free-flow speed
- **f_p** - Page 11-18
- **f_{HV}** - Exhibit 11-8
- **f_LW** - Exhibit 11-9
- **f_LC** - Exhibit 11-10
- **E_R** - Exhibits 11-10, 11-12
- **TRD** - Page 11-11

### Factor Location

- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

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<th>Analyst</th>
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<td>Raju Associates</td>
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<td>Date Performed</td>
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<td>AM Peak Hour</td>
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<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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### Site Information

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<th>Highway/Direction of Travel I-710/Northbound</th>
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### Flow Inputs

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<td>Volume, V</td>
<td>6009 veh/h</td>
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<tr>
<td>Peak-Hour Factor, PHF</td>
<td>0.94</td>
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<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- \( f_p \) = 1.00
- \( E_T \) = 1.5
- \( f_{HV} = \frac{1}{(1+P_T (E_T - 1) + P_R (E_R - 1))} \times 1.000 \)

### Speed Inputs

<table>
<thead>
<tr>
<th>Speed Inputs</th>
<th>Calc Speed Adj and FFS</th>
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</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>RT-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
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</thead>
<tbody>
<tr>
<td>( v_p = \frac{(V \text{ or DDHV) / (PHF x N x f_{HV}}}{x f_p)} \times 2131 \text{ pc/h/ln}</td>
<td>( v_p = \frac{(V \text{ or DDHV) / (PHF x N x f_{HV}}}{x f_p)} \times 52.3 \text{ mph}</td>
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<tr>
<td>( S )</td>
<td>52.3 mph</td>
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<tr>
<td>( D = \frac{v_p}{S} )</td>
<td>40.7 pc/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>E</td>
</tr>
</tbody>
</table>

### Glossary

- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- \( LOS \) - Level of service
- \( DDHV \) - Directional design hour volume
- \( S \) - Speed
- \( D \) - Density
- \( BFFS \) - Base free-flow speed

<table>
<thead>
<tr>
<th>Glossary</th>
<th>Factor Location</th>
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<tbody>
<tr>
<td>( f_{HV} ) - Exhibits 11-10, 11-12</td>
<td>( f_{RW} ) - Exhibit 11-8</td>
</tr>
<tr>
<td>( f_{T} ) - Exhibits 11-10, 11-11, 11-13</td>
<td>( f_{LC} ) - Exhibit 11-9</td>
</tr>
<tr>
<td>( f_p ) - Page 11-18</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, ( v_p ) - Exhibits 11-2, 11-3</td>
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**BASIC FREEWAY WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between PCH & Willow St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

### Flow Inputs
- **Volume, V**: 6850 veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: 
- **AADT**: veh/day
- **%Trucks and Buses, P_T**: 0
- **DDHV = AADT x K x D**: veh/h
- **General Terrain**: Level
- **Grade %**: Up/Down %

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = 1/1+P_T(E_T - 1) + P_R(E_R - 1) = 1.000**

### Speed Inputs
- **Lane Width**: ft
- **RT-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)**: 2429 pc/h/ln
  - **S**: 45.2 mph
  - **D = v_p / S**: 53.7 pc/mi/ln
- **LOS**: F

### Design (N)
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)**: pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **v_p - Flow rate**
- **FFS - Free-flow speed**
- **LOS - Level of service**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**
### General Information

<table>
<thead>
<tr>
<th><strong>Analyst</strong></th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agency or Company</strong></td>
<td>Raju Associates</td>
</tr>
<tr>
<td><strong>Date Performed</strong></td>
<td>8/6/2013</td>
</tr>
<tr>
<td><strong>Analysis Time Period</strong></td>
<td>AM Peak Hour</td>
</tr>
</tbody>
</table>

**Site Information**

| **Highway/Direction of Travel** | I-710/Northbound |
| **From/To** | North of Florence Av |
| **Jurisdiction** | CALTRANS |
| **Analysis Year** | Reduced Project (2026) |

**Project Description**

YTI Project - Port of Los Angeles

**Oper.(LOS)**

### Flow Inputs

| **Volume, V** | 8926 veh/h |
| **AADT** | veh/day |
| **Peak-Hr Prop. of AADT, K** | %RVs, P_R |
| **Peak-Hr Direction Prop, D** | General Terrain: Level |
| **DDHV = AADT \times K \times D** | veh/h |

**Calculate Flow Adjustments**

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \]

**Speed Inputs**

| **Lane Width** | ft |
| **Rt-Side Lat. Clearance** | ft |
| **Number of Lanes, N** | 4 |
| **Total Ramp Density, TRD** | ramps/mi |
| **FFS (measured)** | 65.0 mph |

**Calc Speed Adj and FFS**

| **Calc Speed Adj** | FFS |
| **mph** | 65.0 mph |

**LOS and Performance Measures**

**Operational (LOS)**

\[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \text{ x } N \text{ x } f_{HV} \text{ x } f_p)} \]

\[ S = 51.5 \text{ mph} \]

\[ D = \frac{v_p}{S} \text{ pc/mi/ln} \]

**Design (N)**

\[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \text{ x } N \text{ x } f_{HV} \text{ x } f_p)} \]

\[ S = \text{ mph} \]

\[ D = \frac{v_p}{S} \text{ pc/mi/ln} \]

**Required Number of Lanes, N**

**Glossary**

| **N** - Number of lanes | **S** - Speed |
| **V** - Hourly volume | **D** - Density |
| **v_p** - Flow rate | **FFS** - Free-flow speed |
| **LOS** - Level of service | **BFFS** - Base free-flow speed |
| **DDHV** - Directional design hour volume |

**Factor Location**

| **E_R** - Exhibits 11-10, 11-12 | **f_{HV}** - Exhibit 11-8 |
| **E_T** - Exhibits 11-10, 11-11, 11-13 | **f_{LC}** - Exhibit 11-9 |
| **f_p** - Page 11-18 | TRD - Page 11-11 |
| **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3 |
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
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<td>Raju Associates</td>
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<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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### Site Information

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<th>Highway/Direction of Travel</th>
<th>I-710/Southbound</th>
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<td>From/To</td>
<td>North of Florence Av</td>
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<td>Jurisdiction</td>
<td>CALTRANS</td>
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<tr>
<td>Analysis Year</td>
<td>Reduced Project (2026)</td>
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</table>

### Project Description

- ✔ Oper.(LOS) - Port of Los Angeles
- ❑ Des.(N) - ❑ Planning Data

### Flow Inputs

| Volume, V | 7327 veh/h |
| AADT      |veh/day |
| Peak-Hr Prop. of AADT, K |%Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | General Terrain: |
| DDHV = AADT x K x D | Grade |

### Calculate Flow Adjustments

| $f_p$ | 1.00 |
| $E_T$ | 1.5 |

$$E_R = 1.2$$

$$f_{HV} = \frac{1}{1+P_T(E_T - 1)} + \frac{P_R(E_R - 1)}{1.000}$$

### Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

### Calc Speed Adj and FFS

| $f_{LW}$ | mph |
| $f_{LC}$ | mph |

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
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</thead>
<tbody>
<tr>
<td>$v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV})$</td>
<td>Design LOS</td>
</tr>
<tr>
<td>$v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV})$</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>$S$</td>
<td>60.7 mph</td>
</tr>
<tr>
<td>$D = v_p / S$</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>D</td>
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### Glossary

- N - Number of lanes
- V - Hourly volume
- $v_p$ - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

<table>
<thead>
<tr>
<th>Factor Location</th>
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<tbody>
<tr>
<td>$E_R$ - Exhibits 11-10, 11-12</td>
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<tr>
<td>$f_{LW}$ - Exhibit 11-8</td>
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<tr>
<td>$E_T$ - Exhibits 11-10, 11-11, 11-13</td>
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<tr>
<td>$f_{LC}$ - Exhibit 11-9</td>
</tr>
<tr>
<td>$f_p$ - Page 11-18</td>
</tr>
<tr>
<td>LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3</td>
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</table>
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: n/o I-105 and n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

#### Flow Inputs
- **Volume, V**: 8952 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade %**:
- **Length mi**:
- **Up/Down %**:

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/(1+P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**
  - **S**: 51.4 mph
  - **D = v_p / S**: 46.4 pc/mi/ln
  - **LOS**: F

- **Design (N)**
  - **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln

- **Required Number of Lanes, N**

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

#### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<td>AM Peak Hour</td>
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## Site Information

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<tr>
<th>Highway/Direction of Travel</th>
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<tr>
<td>From/To</td>
<td>n/o I-105 &amp; n/o Firestone</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
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## Project Description

YTI Project - Port of Los Angeles

## Flow Inputs

| Volume, V | 8267 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | |
| Peak-Hr Direction Prop, D | |

## Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + (E_T - 1) + P_R (E_R - 1)} \times 1.000 \)

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## Calc Speed Adj and FFS

| \( f_{LW} \) | mph |
| \( f_{LC} \) | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

## LOS and Performance Measures

| Operational (LOS) | Design (N) |
| \( v_p = \frac{(V \text{ or } DDHV) \times f_{p}}{S} \) | Design LOS |
| 2199 pc/h/ln | \( v_p = \frac{(V \text{ or } DDHV) \times f_{p}}{S} \) |
| 55.9 mph | S pc/h/ln |
| 39.3 pc/mi/ln | D |
| E | LOS |

## Glossary

- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- \( LOS \) - Level of service
- \( DDHV \) - Directional design hour volume

- \( S \) - Speed
- \( D \) - Density
- \( FFS \) - Free-flow speed
- \( BFFS \) - Base free-flow speed

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- \( TRD \) - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<td>Raju Associates</td>
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<td>Date Performed</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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<td>Jurisdiction</td>
<td>CALTRANS</td>
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<tr>
<td>Reduced Project</td>
<td>(2026)</td>
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</table>

## Site Information

| Highway/Direction of Travel | SR-47 Northbound |
| From/To                     | Cdre. Schuyler Heim Bridge |

## Flow Inputs

| Volume, V (veh/h) | 608 |
| AADT (veh/day)    |     |
| Peak-Hour Factor, PHF | 0.94 |
| %Trucks and Buses, P_T | 0   |
| %RVs, P_R         | 0   |

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{f_p + E_T (E_R - 1)} + P_R (E_R - 1) \) \( = 1.000 \)

## Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### Calc Speed Adj and FFS

- \( f_{LW} \)
- \( f_{LC} \)

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_p = \frac{(V \ or \ DDHV) \ or \ (PHF \ x \ N \ x \ f_{HV})}{x \ f_p} )</td>
<td>Design LOS</td>
</tr>
<tr>
<td>( S = 55.0 ) mph</td>
<td>( V_p = \frac{(V \ or \ DDHV) \ or \ (PHF \ x \ N \ x \ f_{HV})}{x \ f_p} )</td>
</tr>
<tr>
<td>( D = V_p / S )</td>
<td>( S )</td>
</tr>
<tr>
<td>LOS</td>
<td>( D = V_p / S )</td>
</tr>
</tbody>
</table>

## Glossary

- N - Number of lanes
- V - Hourly volume
- \( V_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- LOS, S, FFS, \( V_p \) - Exhibits 11-2, 11-3

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3/19/2014
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: SR-47 Southbound
- **From/To**: Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)
- **Oper.(LOS)**

### Flow Inputs

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<th>Description</th>
<th>Value</th>
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<td>Volume, V (veh/h)</td>
<td>1001</td>
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<tr>
<td>AADT (veh/day)</td>
<td></td>
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<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

\[
f_p = 1.00 \quad \quad E_R = 1.2 \quad \quad E_T = 1.5 \quad \quad f_{HV} = \frac{1}{[1 + P_T (E_T - 1)] + P_R (E_R - 1)]}
\]

\[
E_R = 1.2 \quad \quad E_T = 1.5
\]

### Speed Inputs

<table>
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<th>Description</th>
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<td>Lane Width</td>
<td>355 pc/h/ln</td>
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<tr>
<td>Rt-Side Lat. Clearance</td>
<td>3.5 ft</td>
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<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>mph</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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### LOS and Performance Measures

\[
\text{LOS} = \frac{V}{(V + \text{DDHV}) / (\text{PHF} \times N \times f_{HV}} \times \gamma}
\]

### Design (N)

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### Glossary

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<th>Symbol</th>
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<td>N</td>
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<tr>
<td>Hourly volume</td>
<td>V</td>
</tr>
<tr>
<td>Flow rate</td>
<td>V_p</td>
</tr>
<tr>
<td>Level of service</td>
<td>LOS</td>
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<tr>
<td>Directional design hour volume</td>
<td>DDHV</td>
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3/19/2014
**BASIC FREEWAY SEGMENTS WORKSHEET**

**General Information**

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

**Site Information**

- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

**Flow Inputs**

- **Volume, V**: 2270 veh/h
- **AADT**: veh/day
- **Peak-Hour Factor, PHF**: 0.94
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

**Calculate Flow Adjustments**

- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]**: 1.000

**Speed Inputs**

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

**Calc Speed Adj and FFS**

- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

**LOS and Performance Measures**

- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**: 1207 pc/h/ln
  - **S**: 55.0 mph
  - **D = v_p / S**: 21.9 pc/mi/ln
  - **LOS**: C

**Design (N)**

- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**: pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **Required Number of Lanes, N**

**Glossary**

- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

**Factor Location**

- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

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### Site Information

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<tr>
<td>Highway/Direction of Travel</td>
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<td>From/To</td>
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<td>Jurisdiction</td>
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### Oper.(LOS) / Des.(N) / Planning Data

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<tr>
<td>Planning Data</td>
<td></td>
</tr>
</tbody>
</table>

### Flow Inputs

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>2533 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>222 veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>0%</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>2533 veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_p</td>
<td>1.00</td>
</tr>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
<tr>
<td>E_R</td>
<td>1.2</td>
</tr>
<tr>
<td>f_{HV}</td>
<td>\frac{1}{[1 + P_T(E_T - 1) + P_R(E_R - 1)]} 1.000</td>
</tr>
</tbody>
</table>

### Speed Inputs

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>2</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td></td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td>Design (N)</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)</td>
<td>1347 pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>24.5 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>C</td>
</tr>
<tr>
<td>Design LOS</td>
<td></td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>Required Number of Lanes, N</td>
<td></td>
</tr>
</tbody>
</table>

### Glossary

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
<td></td>
</tr>
<tr>
<td>V - Hourly volume</td>
<td></td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td></td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td></td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

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file:///C:/TEMP/f2kE4E4.tmp 3/19/2014
# Basic Freeway Segments Worksheet

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Site Information**: Highway/Direction of Travel
  - SR-91/Westbound
- **Project Description**: YTI Project - Port of Los Angeles
- **Jurisdiction**: CALTRANS
- **From/To**: East of Alameda St & Santa Fe
- **Analysis Year**: Reduced Project (2026)

## Site Information

<table>
<thead>
<tr>
<th>Flow Inputs</th>
<th>Speed Inputs</th>
<th>Loss and Performance Measures</th>
<th>Glossary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volume, V</strong></td>
<td><strong>Operational (LOS)</strong></td>
<td><strong>Design (N)</strong></td>
<td><strong>Factor Location</strong></td>
</tr>
<tr>
<td>9841 veh/h</td>
<td><strong>( v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p) )</strong></td>
<td><strong>Design LOS</strong></td>
<td><strong>E(_R)</strong> - Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>f(_{LV})</strong> - Exhibit 11-8</td>
</tr>
<tr>
<td><strong>AADT</strong></td>
<td><strong>( S = \frac{v_p}{D} )</strong></td>
<td><strong>Design (N)</strong></td>
<td><strong>E(_T)</strong> - Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>veh/day</td>
<td></td>
<td></td>
<td><strong>f(_{LC})</strong> - Exhibit 11-9</td>
</tr>
<tr>
<td><strong>Peak-Hr Prop. of AADT, K</strong></td>
<td><strong>( D = \frac{v_p}{S} )</strong></td>
<td><strong>Design (N)</strong></td>
<td><strong>f(_p)</strong> - Page 11-18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td><strong>Peak-Hr Direction Prop, D</strong></td>
<td></td>
<td></td>
<td>LOS, S, FFS, ( v_p ) - Exhibits 11-2, 11-3</td>
</tr>
<tr>
<td>veh/h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DDHV = AADT x K x D</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Glossary
- **N** - Number of lanes
- **V** - Hourly volume
- **\( v_p\)** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

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3/19/2014
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

## Site Information
- **Highway/Direction of Travel**: SR-91/Eastbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS

## Project Description
- **YTI Project - Port of Los Angeles**

### Flow Inputs
- **Volume, V**: 7829 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: 
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: 

### Calculate Flow Adjustments
- **Calculate Flow Adjustment**
  - \( f_p = 1.00 \)
  - \( E_T = 1.5 \)
  - \( f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \times 1.000 \)

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 6
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \left( V \text{ or } DDHV \right) \times \left( PHF \times N \times f_{HV} \right) \)
  - \( S = 65.0 \text{ mph} \)
  - \( D = \frac{v_p}{S} \)
  - \( C = \text{ LOS} \)

### Design (N)
- **Design (N)**
  - \( v_p = \left( V \text{ or } DDHV \right) \times \left( PHF \times N \times f_{HV} \right) \)
  - \( S = \text{ mph} \)
  - \( D = \frac{v_p}{S} \)

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_{LVW} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-110/Northbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

#### Flow Inputs
- **Volume, V**: 3142 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_HV = 1/(1 + P_T (E_T - 1) + P_R (E_R - 1))**: 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV x f_p)**: 836 pc/h/ln
  - **S**: 65.0 mph
  - **D = v_p / S**: 12.9 pc/mi/ln
  - **LOS**: B
- **Design (N)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV x f_p)**: pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **Required Number of Lanes, N**

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

#### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_C**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
## BASIC FREEWAY WORKSHEET

### General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: PM Peak Hour
- Project Description: YTI Project - Port of Los Angeles

### Site Information
- Highway/Direction of Travel: I-110/Southbound
- From/To: South of C St
- Jurisdiction: CALTRANS
- Analysis Year: Reduced Project (2026)

### Flow Inputs
- Volume, V: 4585 veh/h
- AADT: veh/day
- Peak-Hr Prop. of AADT, K: %
- Peak-Hr Direction Prop, D: %
- DDHV = AADT x K x D: veh/h

### Calculate Flow Adjustments
- \( f_p \) = 1.00
- \( E_T \) = 1.5
- \( E_R \) = 1.2
- \( f_{HV} = 1/\{1 + P_T (E_T - 1) + P_R (E_R - 1)\} \times 1.000 \)

### Speed Inputs
- Number of Lanes, N: 4
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 65.0 mph
- Base free-flow speed, BFFS: mph

### LOS and Performance Measures
- Operational (LOS)
  - \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV}) \times f_p \)
  - \( S = 65.0 \text{ mph} \)
  - \( D = v_p / S \)
  - LOS

### Design (N)
- Design LOS
  - \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV}) \times f_p \)
  - \( S = \) mph
  - \( D = v_p / S \)
  - Required Number of Lanes, N

### Glossary
- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location
- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-405/Northbound
- **From/To**: At Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

#### Site Information
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0

#### Flow Inputs
- **Volume, V**: 9238 veh/h
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **AADT**: veh/day
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_{HV} = 1/[(1+P_T(E_R - 1) + P_R(E_R - 1)]** 1.000

#### Speed Inputs
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)**
  - **S**: 60.5 mph
  - **D**: v_p / S
  - **LOS**: D

#### Design (N)
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)**
  - **S**: mph
  - **D**: v_p / S

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

#### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_{HV}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-405/Southbound
- **From/To**: At Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

## Flow Inputs
- **Volume, V**: 11313 veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %Trucks and Buses, P_T, 0
- **Peak-Hr Direction Prop, D**: %RVs, P_R, 0
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{\frac{1}{1 + P_T(E_T - 1)} + P_R(E_R - 1)} = 1.00 \)

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/ mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures
- **Operational (LOS)**
  \[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \]
  \[ S = 50.6 \text{ mph} \]
  \[ D = v_p / S \]
  \[ LOS = F \]
- **Design (N)**
  \[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \]
  \[ S = \text{ mph} \]
  \[ D = v_p / S \]
  \[ LOS = \text{ Required Number of Lanes, N} \]

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **E_R**: Exhibits 11-10, 11-12
- **f_{HV}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_p**: Page 11-18
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

## Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_{HV} - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_p - Page 11-18
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**: TRD - Page 11-11

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
</tbody>
</table>

## Site Information

<table>
<thead>
<tr>
<th>Project Description</th>
<th>YTI Project - Port of Los Angeles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway/Direction of Travel</td>
<td>I-710/Northbound</td>
</tr>
<tr>
<td>From/To</td>
<td>At Alondra Bl</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>Reduced Project (2026)</td>
</tr>
</tbody>
</table>

## Flow Inputs

| Volume, V | 8777 veh/h |
| AADT      | veh/day |
| Peak-Hr Prop. of AADT, K | 
| Peak-Hr Direction Prop, D | 
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

\[
f_p = 1.00 \quad E_T = 1.5 \quad E_R = 1.2 \quad f_{HV} = \frac{1}{(1 + P_T (E_T - 1)) + P_R (E_R - 1)} = 1.000
\]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design LOS</td>
<td>Design (N)</td>
</tr>
</tbody>
</table>

## Glossary

- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
</tbody>
</table>

Site Information

| Highway/Direction of Travel | I-710/Southbound |
| From/To                     | At Alondra Bl |
| Jurisdiction                | CALTRANS |
| Analysis Year               | Reduced Project (2026) |

Project Description

| YTI Project - Port of Los Angeles |

Oper.(LOS)  Des.(N)  Planning Data

Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V (veh/h)</th>
<th>7831</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT (veh/day)</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K (%)</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
</tr>
</tbody>
</table>

Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5  |
| E_R | 1.2  |
| f_{HV} = 1/(1+P_T(E_T - 1) + P_R(E_R - 1)] | 1.00 |

Speed Inputs

| Lane Width (ft) |      |
| Rt-Side Lat. Clearance (ft) |      |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD (ramps/mi) |      |

Calc Speed Adj and FFS

| f_{LW} | mph |
| f_{LC} | mph |
| FFS (measured) (mph) | 65.0 |
| Base free-flow Speed, BFFS (mph) |      |

LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_{p}) [pc/h/ln]</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>LOS</td>
</tr>
</tbody>
</table>

Design (N)

<table>
<thead>
<tr>
<th>Design LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV} x f_{p}) [pc/h/ln]</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>D</td>
</tr>
</tbody>
</table>

Glossary

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
</tr>
<tr>
<td>LOS - Level of service</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
</tr>
</tbody>
</table>

Factor Location

| E_R - Exhibits 11-10, 11-12 |
| f_{LW} - Exhibit 11-8 |
| E_T - Exhibits 11-10, 11-11, 11-13 |
| f_{LC} - Exhibit 11-9 |
| f_p - Page 11-18 |
| TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 |

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BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between I-405 & Del Amo
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

### Project Description
- **YTI Project - Port of Los Angeles**

### Flow Inputs
- **Volume, V**: 7721 veh/h
- **AADT**: veh/day
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_HV = 1/(1+P_T*(E_T - 1)) + P_R*(E_R - 1)]**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph

### Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \)
  - **S**: 53.4 mph
  - **D = v_p / S**: 38.4 pc/mi/ln
  - **LOS**: E

### Design (N)
- **Design (N)**
- **Design LOS**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \)
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln

### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **V_p - Flow rate**
- **FFS - Free-flow speed**
- **LOS - Level of service**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**

### Factor Location
- **E_R - Exhibits**: 11-10, 11-12
- **f_LW - Exhibit**: 11-8
- **E_T - Exhibits**: 11-10, 11-11, 11-13
- **f_LC - Exhibit**: 11-9
- **f_p - Page**: 11-18
- **TRD - Page**: 11-11
- **LOS, S, FFS, v_p - Exhibits**: 11-2, 11-3

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3/19/2014
### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between I-405 & Del Amo Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

### Flow Inputs
- **Volume, V**: 7048 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- \[ f_p = \frac{1.00}{1 + 0.94} \]
- \[ E_T = 1.5 \]
- \[ E_R = 1.2 \]
- \[ f_{HV} = \frac{1}{1 + f_p (E_T - 1) + f_L (E_R - 1)} \]

### Speed Inputs
- **Lane Width**: 10 ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - \[ v_p = \frac{V}{S} \]
  - \[ D = \frac{v_p}{S} \]
- **Design (N)**
  - \[ v_p = \frac{V}{S} \]
  - \[ D = \frac{v_p}{S} \]

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
# BASIC FREEWAY WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between PCH & Willow St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

## Flow Inputs
- **Volume, V**: 5729 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**:
- **DDHV = AADT x K x D**: veh/h
  - **Peak-Hour Factor, PHF**: 0.94
  - **%Trucks and Buses, P_T**: 0%
  - **%RVs, P_R**: 0%
  - **General Terrain**: Level
  - **Grade % Length mi**: Up/Down %

## Calculate Flow Adjustments
- \[ f_p = 1.00 \]
- \[ E_T = 1.5 \]
  - \[ f_{HV} = \frac{1}{1 + p_t (E_T - 1) + P_R (E_R - 1)} \]
  - \[ E_R = 1.2 \]

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph
  - **Calc Speed Adj and FFS**
    - \[ f_{LW} \]
    - \[ f_{LC} \]
    - **TRD Adjustment**: mph
    - **FFS**: 55.0 mph

## LOS and Performance Measures
- **Operational (LOS)**
  - \[ v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV} \times f_p)} \]
  - **S**: 53.7 mph
  - **D**: \[ \frac{v_p}{S} \]
  - **LOS**: E
  - **Required Number of Lanes, N**

## Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_{LW} - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_{LC} - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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**BASIC FREEWAY WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between PCH & Willow St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

### Project Description
- **Project**: YTI Project - Port of Los Angeles

### Flow Inputs
- **Volume, V**: 6170 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV})**: 2188 pc/h/ln
  - **S**: 51.3 mph
  - **D = v_p / S**: 42.7 pc/mi/ln
  - **LOS**: E

### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

### Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_{LV}
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_{LC}
- **f_p - Page 11-18**: TRD
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

### Project Description
**YTI Project - Port of Los Angeles**

### Flow Inputs
- **Volume, V**: 7265 veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **AADT (veh/day)**
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D, veh/h**

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/(1 + P_r(T - 1) + P_r(E_r - 1))**: 1.00

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD, ramps/mi**
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **E_r**: Exhibits 11-10, 11-12
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_p**: Page 11-18
- **TRD**: Page 11-11

### Factor Location

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### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** North of Florence Av
- **Jurisdiction:** CALTRANS
- **Analysis Year:** Reduced Project (2026)

### Flow Inputs
- **Volume, V:** 8128 veh/h
- **AADT:**
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:**

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_R:** 1.2
- **E_T:** 1.5
- \( f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \times 1.000 \)

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/MI
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

### LOS and Performance Measures
- **Operational (LOS):**
  - \( v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV})} \) pc/h/ln
  - \( S = \frac{v_p}{D} \) mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - **LOS:** E

### Design (N)
- **Design LOS**
  - \( v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV})} \) pc/h/ln
  - \( S = \frac{v_p}{D} \) mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - **Required Number of Lanes, N**

### Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **v_p:** Flow rate
- **FFS:** Free-flow speed
- **LOS:** Level of service
- **BFFS:** Base free-flow speed
- **DDHV:** Directional design hour volume

### Factor Location
- **E_R:** Exhibits 11-10, 11-12
- **f_LW:** Exhibit 11-8
- **E_T:** Exhibits 11-10, 11-11, 11-13
- **f_LC:** Exhibit 11-9
- **f_p:** Page 11-18
- **TRD:** Page 11-11
- **LOS:** Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** n/o I-105 and n/o Firestone
- **Jurisdiction:** CALTRANS
- **Analysis Year:** Reduced Project (2026)

#### Flow Inputs
| Volume, V | 8005 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T | 0 |
| Peak-Hr Direction Prop, D | %RVs, P_R | 0 |
| DDHV = AADT x K x D | veh/h |

#### Calculate Flow Adjustments
- \( f_p \) = 1.00
- \( E_T \) = 1.5
- \( f_{HV} = 1/1+(P_T/1+P_R(P_T-1)) \) = 1.00

#### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

#### LOS and Performance Measures
- **Operational (LOS):**
  \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV}) \) = 2129 pc/h/ln
  \( S = 57.5 \text{ mph} \)
  \( D = v_p / S = 37.0 \text{ pc/mi/ln} \)

#### Design (N)
- **Design LOS**
- **Design (N):**
  \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV}) \) = pc/h/ln
  \( S = \text{ mph} \)
  \( D = v_p / S = \text{ pc/mi/ln} \)

#### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **LOS** - Level of service
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume

#### Factor Location
- **E_R** - Exhibits 11-10, 11-12
- **f_{HV}** - Exhibit 11-8
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

<table>
<thead>
<tr>
<th>General Information</th>
<th>Site Information</th>
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<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
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<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
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<td>PM Peak Hour</td>
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<tr>
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<td>Oper.(LOS)</td>
<td>Des.(N)</td>
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<td>Planning Data</td>
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#### Flow Inputs

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<thead>
<tr>
<th>Volume, V</th>
<th>8746 veh/h</th>
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<tbody>
<tr>
<td>AADT</td>
<td>veh/day</td>
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<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T</td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain:</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

**Calculate Flow Adjustments**

\[ f_p = 1.00 \]

\[ E_T = 1.5 \]

\[ f_{HV} = \frac{1}{(1 + P_T(E_T - 1) + P_R(E_R - 1))} \]

**Speed Inputs**

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

**Calc Speed Adj and FFS**

- **Calc Speed Adj**: mph
- **FFS**: 65.0 mph

#### LOS and Performance Measures

**Design (N)**

**Operational (LOS)**

\[ v_p = \frac{V \text{ or DDHV}}{(PHF \times N \times f_{HV} \text{ or } f_p)} \]

\[ S = 52.8 \text{ mph} \]

\[ D = \frac{v_p}{S} \]

\[ E = \text{LOD} \]

**Design LOS**

\[ v_p = \frac{V \text{ or DDHV}}{(PHF \times N \times f_{HV} \text{ or } f_p)} \]

\[ S = \text{mph} \]

\[ D = \frac{v_p}{S} \]

\[ E = \text{pc/mi/ln} \]

**Required Number of Lanes, N**

**Glossary**

- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **f_p** - Flow rate
- **BFFS** - Base free-flow speed
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

**Factor Location**

- **E_R** - Exhibits 11-10, 11-12
- **f_{HV}** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3

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<td>Raju Associates</td>
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<td>PM Peak Hour</td>
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<tr>
<th><strong>Flow Inputs</strong></th>
<th><strong>Calculate Flow Adjustments</strong></th>
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<tbody>
<tr>
<td>Volume, V</td>
<td>1089 veh/h</td>
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<td>AADT</td>
<td>veh/day</td>
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<tr>
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<td>%RVs, P_R</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain: Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
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</table>

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<tr>
<th><strong>Flow Inputs</strong></th>
<th><strong>Calculate Flow Adjustments</strong></th>
</tr>
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<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
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<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
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<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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<th><strong>Flow Inputs</strong></th>
<th><strong>Calculate Flow Adjustments</strong></th>
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<tbody>
<tr>
<td>Speed Inputs</td>
<td>Calc Speed Adj and FFS</td>
</tr>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Flow Inputs</strong></th>
<th><strong>Calculate Flow Adjustments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS and Performance Measures</td>
<td>Design (N)</td>
</tr>
<tr>
<td>Operational (LOS)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
</tr>
<tr>
<td>S</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>7.0 pc/mi/in</td>
</tr>
<tr>
<td>LOS</td>
<td>A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Glossary</strong></th>
<th><strong>Factor Location</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
<td>S - Speed</td>
</tr>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td>E_R - Exhibits 11-10, 11-12</td>
</tr>
</tbody>
</table>

**HCS 2010™** Version 6.50 Generated: 3/19/2014 5:56 PM
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: SR-47 Southbound
- **From/To**: at Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

## Flow Inputs
- **Volume, V**: 838 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade**: %
- **Length**: mi
- **Up/Down %**:

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_HV = 1/f_p [E_T / (E_T - 1) + P_R / (E_R - 1)]**: 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**
- **Design LOS**
- **Required Number of Lanes, N**

## Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **LOS**: Level of service
- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

### Site Information
- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)
- **Project Description**: YTI Project - Port of Los Angeles

### Flow Inputs
- **Volume, V**: 3064 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**: 1630 pc/h/ln
  - **S**: 55.0 mph
  - **D = v_p / S**: 29.6 pc/mi/ln
  - **LOS**: D

### Design (N)
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**: pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **Required Number of Lanes, N**:

### Glossary
- **N - Number of lanes**
- **V - Hourly volume**
- **v_p - Flow rate**
- **LOS - Level of service**
- **DDHV - Directional design hour volume**
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: SR-47/Eastbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: Reduced Project (2026)

## Flow Inputs
- **Volume, V**: 2703 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade % Length**: Up/Down%

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

## Calc Speed Adj and FFS
- **f_LW**: mph
- **f_E**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

## LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**
  - **S**: 55.0 mph
  - **D**: 26.1 pc/mi/ln
  - **LOS**: 

## Design (N)
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_HV)**
  - **S**: mph
  - **D**: pc/mi/ln

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_E - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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3/19/2014
## BASIC FREeways SEGMENTS WORKSHEET

### General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
<th>Highway/Direction of Travel</th>
<th>SR-91/Westbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
<td>From/To</td>
<td>East of Alameda St &amp; Santa Fe</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
<td>Analysis Year</td>
<td>Reduced Project (2026)</td>
</tr>
</tbody>
</table>

### Site Information

- Project Description: YTI Project - Port of Los Angeles
- Oper.(LOS): ☑
- Des.(N): ☐
- Planning Data: ☐

### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>7082</th>
<th>Peak-Hour Factor, PHF</th>
<th>0.94</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td>veh/h</td>
<td>%Trucks and Buses, P&lt;sub&gt;T&lt;/sub&gt;</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
<td>%RVs, P&lt;sub&gt;R&lt;/sub&gt;</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
<td>General Terrain: Level</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
<td>Grade % Length mi</td>
<td>Up/Down %</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

\[
E_R = 1.2 \\
f_hv = \frac{1}{f_p(1 + E_T(1 - 1) + P_R(E_R - 1))} \times 1.000
\]

### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>6</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design LOS</td>
</tr>
<tr>
<td>Design (N)</td>
</tr>
</tbody>
</table>

### Glossary

- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **V<sub>p</sub>**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

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BASIC FREEWAY SEGMENTS WORKSHEET

<table>
<thead>
<tr>
<th>General Information</th>
<th>Site Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway/Direction of Travel</td>
<td>SR-91/Eastbound</td>
</tr>
<tr>
<td>From/To</td>
<td>East of Alameda St &amp; Santa Fe</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Reduced Project (2026)</td>
<td></td>
</tr>
</tbody>
</table>

**Flow Inputs**

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>9129</th>
<th>vehicle/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td></td>
<td>vehicle/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td></td>
<td>vehicle/hour</td>
</tr>
</tbody>
</table>

**Calculate Flow Adjustments**

| $f_p$ | 1.00 | |
| $E_T$ | 1.5  | |
| $f_{HV}$ | $\frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)}$ | 1.00 |

**Flow Inputs**

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>9129</th>
<th>vehicle/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td></td>
<td>vehicle/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
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<td>Peak-Hr Direction Prop, D</td>
<td>%</td>
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<tr>
<td>DDHV = AADT x K x D</td>
<td></td>
<td>vehicle/hour</td>
</tr>
</tbody>
</table>

**Calculate Flow Adjustments**

| $f_p$ | 1.00 | |
| $E_T$ | 1.5  | |
| $f_{HV}$ | $\frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)}$ | 1.00 |

**Speed Inputs**

| Lane Width         | ft   |
|                   |      |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 6    |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured)     | 65.0 | mph |
| Base free-flow Speed, BFFS | mph |

**Speed Inputs**

| Lane Width         | ft    |
| Rt-Side Lat. Clearance | ft  |
| Number of Lanes, N | 6     |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured)     | 65.0  | mph |
| Base free-flow Speed, BFFS | mph |

**Calculate Speed Adj and FFS**

| $f_{LW}$ | mph |
| $f_{LC}$ | mph |
| TRD Adjustment | mph |
| FFS | 65.0 | mph |

**LOS and Performance Measures**

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)}$</td>
<td>Design LOS</td>
</tr>
<tr>
<td>$S$</td>
<td>64.3</td>
</tr>
<tr>
<td>$D = \frac{v_p}{S}$</td>
<td>25.2</td>
</tr>
<tr>
<td>LOS</td>
<td>N</td>
</tr>
</tbody>
</table>

**LOS and Performance Measures**

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)}$</td>
<td>Design LOS</td>
</tr>
<tr>
<td>$S$</td>
<td>64.3</td>
</tr>
<tr>
<td>$D = \frac{v_p}{S}$</td>
<td>25.2</td>
</tr>
<tr>
<td>LOS</td>
<td>N</td>
</tr>
</tbody>
</table>

**Factor Location**

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>$v_p$ - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

**Factor Location**

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<th>S - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>$v_p$ - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

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2026 NEPA BASELINE
(2026 WITHOUT PROJECT)

AM/PM PEAK HOURS
### Basic Freeway Segments Worksheet

#### General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

#### Site Information

| Highway/Direction of Travel | I-110/Northbound |
| From/To | South of C St |
| Jurisdiction | CALTRANS |
| Analysis Year | 2026 NEPA Baseline |

#### Flow Inputs

| Volume, V | 6384 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | |
| Peak-Hr Direction Prop, D | |
| DDHV = AADT x K x D | veh/h |

#### Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5 |
| f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} | 1.000 |

#### Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

#### Calc Speed Adj and FFS

| f_{ LW} | mph |
| f_{ LC} | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

#### LOS and Performance Measures

| Operational (LOS) | Design (N) |
| v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p) | v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p) |
| S | 63.7 pc/h/ln |
| D = v_p / S | 26.6 pc/mi/ln |
| LOS | D |

| Design LOS | Required Number of Lanes, N |
| Design (N) | |

#### Glossary

| N | Number of lanes |
| V | Hourly volume |
| V_p | Flow rate |
| LOS | Level of service |
| DDHV | Directional design hour volume |

### Factor Location

| E_R - Exhibits 11-10, 11-12 | f_{ LW} - Exhibit 11-8 |
| E_T - Exhibits 11-10, 11-11, 11-13 | f_{ LC} - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 |
### General Information
- **Analyst**: RA  
- **Agency or Company**: Raju Associates  
- **Date Performed**: 8/6/2013  
- **Analysis Time Period**: AM Peak Hour

### Site Information
- **Highway/Direction of Travel**: I-110/Southbound  
- **From/To**: South of C St  
- **Jurisdiction**: CALTRANS  
- **Analysis Year**: 2026 NEPA Baseline

### Project Description
- **YTI Project - Port of Los Angeles**

### Oper.(LOS)

<table>
<thead>
<tr>
<th>Flow Inputs</th>
<th>Site Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V = 4486 veh/h</td>
<td>Site Information</td>
</tr>
<tr>
<td>AADT = veh/day</td>
<td>Analysis Year: 2026 NEPA Baseline</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>Jurisdiction: CALTRANS</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>Site Information</td>
</tr>
<tr>
<td>DDHV = AADT x K x D veh/h</td>
<td>Analysis Year: 2026 NEPA Baseline</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- $f_p = 1.00$  
- $E_T = 1.5$  
- $E_R = 1.2$  
- $f_{HV} = \frac{1}{1 + 10^{(E_T - 1) + P_R(E_R - 1)}} = 1.000$

### Speed Inputs

- **Lane Width**: ft  
- **RT-Side Lat. Clearance**: ft  
- **Number of Lanes, N**: 4  
- **Total Ramp Density, TRD ramps/mi**  
- **FFS (measured)**: 65.0 mph  
- **Base free-flow speed, BFFS mph**

### Calc Speed Adj and FFS

- $f_{LW} = \text{mph}$  
- $f_{LC} = \text{mph}$  
- $E_{R} = \text{mph}$  
- $FFS = 65.0$ mph

### LOS and Performance Measures

- **Operational (LOS)**
  - $v_p = \frac{(V \text{ or DDHV})}{(\text{PHF} \times N \times f_{HV})}$  
  - $S = 65.0$ mph  
  - $D = v_p / S$  
  - $C = \text{pc/mi/ln}$  
  - $LOS = \text{pc/mi/ln}$
  
- **Design (N)**
  - Design LOS
  - $v_p = \frac{(V \text{ or DDHV})}{(\text{PHF} \times N \times f_{HV})}$  
  - $S = \text{mph}$  
  - $D = v_p / S$  
  - $C = \text{pc/mi/ln}$

### Glossary
- N - Number of lanes  
- V - Hourly volume  
- Vp - Flow rate  
- LOS - Level of service  
- DDHV - Directional design hour volume

### Factor Location
- $E_R = \text{Exhibits 11-10, 11-12}$  
- $f_{LW} = \text{Exhibit 11-8}$  
- $E_T = \text{Exhibits 11-10, 11-11, 11-13}$  
- $f_{LC} = \text{Exhibit 11-9}$  
- $f_p = \text{Page 11-18}$  
- TRD - Page 11-11  
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3

---

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**HCS 2010™ Version 6.50**

**Generated: 2/5/2014 2:52 PM**
### Basic Freeway Segments Worksheet

#### General Information

<table>
<thead>
<tr>
<th><strong>Analyst</strong></th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agency or Company</strong></td>
<td>Raju Associates</td>
</tr>
<tr>
<td><strong>Date Performed</strong></td>
<td>8/6/2013</td>
</tr>
<tr>
<td><strong>Analysis Time Period</strong></td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td><strong>Project Description</strong></td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

#### Site Information

| **Highway/Direction of Travel** | I-405/Northbound |
| **From/To** | At Santa Fe Av |
| **Jurisdiction** | CALTRANS |
| **Analysis Year** | 2026 NEPA Baseline |

#### Flow Inputs

| **Volume, V** | 12796 veh/h |
| **AADT** | veh/day |
| **Peak-Hr Prop. of AADT, K** | % |
| **Peak-Hr Direction Prop, D** | veh/h |
| **DDHV = AADT x K x D** | veh/h |

#### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + p_T(f_p - 1)} + p_R(E_T - 1) \cdot 1.00 \)

#### Speed Inputs

| **Lane Width** | ft |
| **Rt-Side Lat. Clearance** | ft |
| **Number of Lanes, N** | 5 |
| **Total Ramp Density, TRD** | ramps/mi |
| **FFS (measured)** | 65.0 mph |
| **Base free-flow Speed, BFFS** | mph |

#### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th><strong>Calc Speed Adj and FFS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>( f_{LW} )</td>
</tr>
<tr>
<td>( f_{LC} )</td>
</tr>
<tr>
<td>( f_{HV} )</td>
</tr>
</tbody>
</table>

#### LOS and Performance Measures

<table>
<thead>
<tr>
<th><strong>Operational (LOS)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = \frac{(V or DDHV)}{(PHF \times N \times f_{HV})} \times f_p )</td>
</tr>
<tr>
<td>( S )</td>
</tr>
<tr>
<td>( D = \frac{v_p}{S} )</td>
</tr>
<tr>
<td><strong>LOS</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Design (N)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = \frac{(V or DDHV)}{(PHF \times N \times f_{HV})} \times f_p )</td>
</tr>
<tr>
<td>( S )</td>
</tr>
<tr>
<td>( D = \frac{v_p}{S} )</td>
</tr>
<tr>
<td><strong>LOS, S, FFS, v_p - Exhibits 11-2</strong></td>
</tr>
</tbody>
</table>

#### Glossary

<table>
<thead>
<tr>
<th><strong>N</strong> - Number of lanes</th>
<th><strong>S</strong> - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>V</strong> - Hourly volume</td>
<td><strong>D</strong> - Density</td>
</tr>
<tr>
<td><strong>v_p</strong> - Flow rate</td>
<td><strong>FFS</strong> - Free-flow speed</td>
</tr>
<tr>
<td><strong>LOS</strong> - Level of service</td>
<td><strong>BFFS</strong> - Base free-flow speed</td>
</tr>
<tr>
<td><strong>DDHV</strong> - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

#### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour

#### Site Information
- **Highway/Direction of Travel:** I-405/Southbound
- **From/To:** At Santa Fe Av
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 NEPA Baseline
- **Project Description:** YTI Project - Port of Los Angeles

#### Oper.(LOS)

<table>
<thead>
<tr>
<th>Flow Inputs</th>
<th>Speed Inputs</th>
<th>Calc Speed Adj and FFS</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>Lane Width</td>
<td>f_p</td>
<td>Design LOS</td>
</tr>
<tr>
<td>AADT</td>
<td>Ft</td>
<td>E_R</td>
<td>N</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>Ft</td>
<td>E_T</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>Ramps/mi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>Ft</td>
<td>fHV = 1/(1+P_T(E_T - 1) + P_R(E_R - 1)] 1.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>f_p</td>
<td>E_R</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E_T</td>
<td>FFS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOS and Performance Measures</td>
<td>Calc Speed Adj and FFS</td>
<td>Design (N)</td>
<td></td>
</tr>
<tr>
<td>Operational (LOS)</td>
<td></td>
<td>Design LOS</td>
<td></td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x fHV)</td>
<td></td>
<td>v_p = (V or DDHV) / (PHF x N x fHV)</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td></td>
<td>f_p</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Glossary
- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

#### Factor Location
- E_R - Exhibits 11-10, 11-12
- f_p - Page 11-18
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
- f_LW - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_LC - Exhibit 11-9
- TRD - Page 11-11
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information

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<tr>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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**Site Information**

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>I-710/Northbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>From/To</td>
<td>At Alondra Bl</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 NEPA Baseline</td>
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</tbody>
</table>

#### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>8118 veh/h</th>
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</thead>
<tbody>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%RVs, P_R</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain:</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>Grade</td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5  |
| E_R | 1.2  |

\[ f_{HV}^* = \frac{1}{1} + \frac{P_T E_T - 1}{1} + \frac{P_R E_R - 1}{1} \times 1.00 \]

#### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

#### Calc Speed Adj and FFS

| f_{LW} | mph |
| f_{LC} | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

#### LOS and Performance Measures

**Operational (LOS)**

\[ v_p = \frac{(V \text{ or } DDHV) \times f_p}{(PHF \times N \times f_{HV})} \]

| S | 63.5 mph |
| D | 27.2 pc/mi/ln |
| LOS | D |

**Design (N)**

\[ v_p = \frac{(V \text{ or } DDHV) \times f_p}{(PHF \times N \times f_{HV})} \]

| E_R - Exhibits 11-10, 11-12 | f_{LC} - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |

**Glossary**

- N - Number of lanes
- V - Hourly volume
- f_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

**Factor Location**

- E_R - Exhibits 11-10, 11-12
- f_{LW} - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_{LC} - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>I-710/Southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>From/To</td>
<td>At Alondra Bli</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 NEPA Baseline</td>
</tr>
</tbody>
</table>

## Flow Inputs

| Volume, V | 10572 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | % |
| Peak-Hr Direction Prop, D | % |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ f_{HV} = \frac{1}{1 + P_T (E_T - 1)} + P_R (E_R - 1) \cdot 1.00 \]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \times \frac{2249}{2249} \text{ pc/h/ln} ]</td>
<td>Design LOS</td>
</tr>
<tr>
<td>S</td>
<td>54.8 mph</td>
</tr>
<tr>
<td>D = \frac{v_p}{S}</td>
<td>41.1 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>E</td>
</tr>
<tr>
<td>Required Number of Lanes, N</td>
<td></td>
</tr>
</tbody>
</table>

## Glossary

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>[ v_p ] - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

## Factor Location

| \[ E_R \] - Exhibits 11-10, 11-12 | \[ f_{LV} \] - Exhibit 11-8 |
| \[ E_T \] - Exhibits 11-10, 11-11, 11-13 | \[ f_{LC} \] - Exhibit 11-9 |
| \[ f_p \] - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, \[ v_p \] - Exhibits 11-2, 11-3 |

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### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour

### Site Information
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** Between I-405 & Del Amo BI
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 NEPA Baseline

### Project Description
- **YTI Project - Port of Los Angeles**

### Flow Inputs
- **Volume, V:** 8744 veh/h
- **AADT:** 8744 veh/day
- **Peak-Hour Factor, PHF:** 0.94
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:**

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_T:** 1.5
- **E_R:** 1.2
- **f_{HV} = \frac{1}{f_p [1 + P_T (E_T - 1) + P_R (E_R - 1)]}**: 1.000

### Speed Inputs
- **Lane Width:**
- **Rt-Side Lat. Clearance:**
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:**

### LOS and Performance Measures
- **Operational (LOS):**
- **Design (N):**

### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_{LVW} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between I-405 & Del Amo BI
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

## Flow Inputs
| Volume, V | 9179 | veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, PT | 0.94 |
| Peak-Hr Direction Prop, D | General Terrain: Level |

### Calculate Flow Adjustments
- f_p = 1.00
- E_T = 1.5
- E_R = 1.2
- f_HV = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \times 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

## Calc Speed Adj and FFS
- f_LW
- f_LC
- TRD Adjustment
- FFS

## LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

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2/5/2014
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between PCH & Willow St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

## Flow Inputs
- **Volume, V**: 7969 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = \frac{1}{1+P_T(E_T - 1) + P_E(E_E - 1)}**: 1.00

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

## Calc Speed Adj and FFS
- **f_{LW}**: mph
- **f_{LC}**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

## LOS and Performance Measures
- **LOS**: Design (N)
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} x f_p)} \)
  - **S**: 29.0 mph
  - **D**: \( \frac{v_p}{S} \)
  - **LOS**: F

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_{LW} - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_{LC} - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
## BASICS FREEWAY SEGMENT WORKSHEET

### General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: AM Peak Hour

### Site Information
- Highway/Direction of Travel: I-710/Southbound
- From/To: Between PCH & Willow St
- Jurisdiction: CALTRANS
- Analysis Year: 2026 NEPA Baseline

### Project Description
- YTI Project - Port of Los Angeles

#### Flow Inputs
- Volume, V: 8670 veh/h
- AADT: veh/day
- Peak-Hr Prop. of AADT, K: %
- Peak-Hr Direction Prop, D: %
- DDHV = AADT x K x D: veh/h

#### Calculate Flow Adjustments
- \( f_p \): 1.00
- \( E_T \): 1.5
- \( E_R \): 1.2
- \( f_{HV} \) = \( \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \times 1.000 \)

#### Speed Inputs
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 3
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 55.0 mph
- Base free-flow speed, BFFS: mph

#### LOS and Performance Measures
- Operational (LOS)
  - \( v_p \) = (V or DDHV) / (PHF x N x \( f_{HV} \)) pc/h/ln
  - \( S \) = 14.9 mph
  - \( D \) = \( \frac{v_p}{S} \) pc/mi/ln
  - LOS = \( F \)

#### Design (N)
- Design LOS
  - \( v_p \) = (V or DDHV) / (PHF x N x \( f_{HV} \)) pc/h/ln
  - \( S \) = mph
  - \( D \) = \( \frac{v_p}{S} \) pc/mi/ln
  - Required Number of Lanes, N

### Glossary
- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location
- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

---

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

### Site Information
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, PT**: 0
- **%RVs, PR**: 0
- **General Terrain**: Level
- **Grade**: %
- **Length**: mi
- **Up/Down %**:

### Flow Inputs
- **Volume, V**: 9243 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**:
- **Peak-Hr Direction Prop, D**:
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = 1/[(1+P_T)(E_T - 1) + P_R(E_R - 1)]**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**
- **Target LOS**: Design LOS
- **LOS**: Required Number of Lanes, N

### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_{HV}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, V_p**: Exhibits 11-2, 11-3
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Jurisdiction**: CALTRANS
- **Site Information**: Highway/Direction of Travel I-710/Southbound
- **From/To**: North of Florence Av
- **Analysis Year**: 2026 NEPA Baseline

### Site Information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Project</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
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<tr>
<td>Site Information</td>
<td>Highway/Direction of Travel I-710/Southbound</td>
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<tr>
<td>From/To</td>
<td>North of Florence Av</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 NEPA Baseline</td>
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</table>

### Flow Inputs

<table>
<thead>
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<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>7691 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculating Flow Adjustments

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_p</td>
<td>1.00</td>
</tr>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- \( f_{HV} = \frac{1}{1 + P_r} (E_T - 1) + \frac{P_r}{E_T} (E_T - 1) \)

### Speed Inputs

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/ mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
</tbody>
</table>

### Speed Inputs (continued)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### Speed Adj and FFS

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_LW</td>
<td>mph</td>
</tr>
<tr>
<td>f_LC</td>
<td>mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td>Design (N)</td>
</tr>
</tbody>
</table>

### Calculating LOS

- \( v_p = \frac{V + DDHV}{PHF \times N \times f_{HV}} \)

### Glossary

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>f_p</td>
<td>Flow rate</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
</tr>
<tr>
<td>DDHV</td>
<td>Directional design hour volume</td>
</tr>
</tbody>
</table>

### Factor Location

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>E_r</td>
<td>Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>f_LW</td>
<td>Exhibit 11-8</td>
</tr>
<tr>
<td>E_T</td>
<td>Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>f_LC</td>
<td>Exhibit 11-9</td>
</tr>
<tr>
<td>f_p</td>
<td>Page 11-18</td>
</tr>
<tr>
<td>TRD</td>
<td>Page 11-11</td>
</tr>
</tbody>
</table>

### Design (N)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design LOS</td>
<td></td>
</tr>
<tr>
<td>Required Number of Lanes, N</td>
<td></td>
</tr>
</tbody>
</table>

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## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: n/o I-105 and n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

## Flow Inputs
<table>
<thead>
<tr>
<th>Volume, V</th>
<th>AADT</th>
<th>Peak-Hr Prop. of AADT, K</th>
<th>Peak-Hr Direction Prop, D</th>
<th>DDHV = AADT x K x D</th>
</tr>
</thead>
<tbody>
<tr>
<td>9234 veh/h</td>
<td>veh/day</td>
<td>%Trucks and Buses, P_T</td>
<td>%RVs, P_R</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + [P_T(E_T - 1) + P_R(E_R - 1)]} \times 1.000 \)

## Speed Inputs
- **Lane Width**: ft
- **RT-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures

### Operational (LOS)
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \)
  - \( v_p = \frac{2456}{49.2} \text{ pc/h/ln} \)
  - \( S = 49.2 \text{ mph} \)
  - \( D = \frac{v_p}{S} = 49.9 \text{ pc/mi/ln} \)

## Glossary
- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- \( LOS \) - Level of service
- \( DDHV \) - Directional design hour volume

---

**Design (N)**

### Design LOS
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \)
  - \( v_p = \frac{2456}{49.2} \text{ pc/h/ln} \)
  - \( S = 49.2 \text{ mph} \)
  - \( D = \frac{v_p}{S} = 49.9 \text{ pc/mi/ln} \)

**Required Number of Lanes, N**

---

**Factor Location**

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- \( TRD \) - Page 11-11

---

**LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3**
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: n/o I-105 & n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

### Flow Inputs
- **Volume, V**: 8360 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_HV = 1/(1 + f_p(E_T - 1) + P_T(E_R - 1))**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly Volume
- **D**: Density
- **f_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

---

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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</table>

### Site Information

| Highway/Direction of Travel | SR-47 Northbound |
| From/To | at Cdre. Schuyler Heim Bridge |
| Jurisdiction | CALTRANS |
| Analysis Year | 2026 NEPA Baseline |

### Flow Inputs

| Volume, V | 2578 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT | 0.94 |
| Peak-Hr Direction Prop. | 0 |
| DDHV = AADT x K x D | veh/h |

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Flow Adjustment</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f_p$</td>
<td>1.00</td>
</tr>
<tr>
<td>$E_T$</td>
<td>1.5</td>
</tr>
<tr>
<td>$E_R$</td>
<td>1.2</td>
</tr>
<tr>
<td>$f_{HV}$</td>
<td>1.000</td>
</tr>
</tbody>
</table>

### Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 3 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 55.0 mph |
| Base free-flow Speed, BFFS | mph |

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v_p = (V or DDHV) / (PHF x N x f_{HV} \times f_p)$</td>
<td>$v_p = (V or DDHV) / (PHF x N x f_{HV} \times f_p)$</td>
</tr>
<tr>
<td>S</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>D</td>
<td>16.6 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>B</td>
</tr>
<tr>
<td>LOS, S, FFS, $v_p$</td>
<td>Exhibits 11-2, 11-3</td>
</tr>
</tbody>
</table>

### Glossary

- N - Number of lanes
- V - Hourly volume
- $v_p$ - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed
- $E_R$ - Exhibits 11-10, 11-12
- $E_T$ - Exhibits 11-10, 11-11, 11-13
- $f_{HV}$ - Exhibit 11-8
- $f_{LC}$ - Exhibit 11-9
- $f_p$ - Page 11-18
- TRD - Page 11-11

### Factor Location

<table>
<thead>
<tr>
<th>Glossary</th>
<th>Factor Location</th>
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</thead>
<tbody>
<tr>
<td>$E_R$ - Exhibits 11-10, 11-12</td>
<td>$f_{LC}$ - Exhibit 11-9</td>
</tr>
<tr>
<td>$E_T$ - Exhibits 11-10, 11-11, 11-13</td>
<td>$f_{HV}$ - Exhibit 11-8</td>
</tr>
<tr>
<td>$f_p$ - Page 11-18</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3</td>
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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
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<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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## Site Information

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<thead>
<tr>
<th>Site Information</th>
<th>Project Description</th>
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<tbody>
<tr>
<td>Highway/Direction of Travel</td>
<td>SR-47 Southbound at Cdre. Schuyler Heim Bridge</td>
</tr>
<tr>
<td>From/To</td>
<td>Jurisdiction CALTRANS</td>
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<tr>
<td>Analysis Year</td>
<td>2026 NEPA Baseline</td>
</tr>
</tbody>
</table>

## Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>AADT</th>
<th>Peak-Hr Prop. of AADT, K</th>
<th>Peak-Hr Direction Prop, D</th>
<th>DDHV = AADT x K x D</th>
</tr>
</thead>
<tbody>
<tr>
<td>3407 veh/h</td>
<td>1.00</td>
<td>0.94</td>
<td>0</td>
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</tr>
</tbody>
</table>

## Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>f_p</th>
<th>E_T</th>
<th>f_HV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>1.5</td>
<td>1.000</td>
</tr>
</tbody>
</table>

## Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>Rt-Side Lat. Clearance</th>
<th>Number of Lanes, N</th>
<th>Total Ramp Density, TRD</th>
<th>FFS (measured)</th>
<th>Base free-flow Speed, BFFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ft</td>
<td>ft</td>
<td>3</td>
<td>ramps/mi</td>
<td>55.0 mph</td>
<td>mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>S = 55.0 mph</td>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
</tr>
<tr>
<td>D = v_p / S = 22.0 pc/mi/ln</td>
<td>S = mph</td>
</tr>
<tr>
<td>LOS = C</td>
<td>D = v_p / S = pc/mi/ln</td>
</tr>
</tbody>
</table>

## Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- BFFS - Base free-flow speed

## Factor Location

- E_R - Exhibits 11-10, 11-12
- f_LW - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_LC - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel:** SR-47/Eastbound
- **From/To:** at Vincent Thomas Bridge
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 NEPA Baseline

#### Oper.(LOS)  Des.(N)  Planning Data

#### Flow Inputs
- **Volume, V:** 3405 veh/h
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, P_T:** 0
- **%RVs, P_R:** 0
- **General Terrain:** Level
- **Grade %:**
- **Length mi:**
- **Up/Down %:**

#### Calculate Flow Adjustments
- \( f_P = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \times 1.000 \)

#### Speed Inputs
- **Lane Width:** ft
- **RT-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 2
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:** mph

#### Calc Speed Adj and FFS
- **\( f_LW \):** mph
- **\( f_{LC} \):** mph
- **TRD Adjustment:** mph
- **FFS:** 55.0 mph

#### LOS and Performance Measures
- **LOS:**
- **Required Number of Lanes, N:**

#### Design (N)

#### Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **v_p:** Flow rate
- **FFS:** Free-flow speed
- **BFFS:** Base free-flow speed
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

---

### Factor Location
- **\( E_R \):** Exhibits 11-10, 11-12
- **\( f_{LVW} \):** Exhibit 11-8
- **\( E_T \):** Exhibits 11-10, 11-11, 11-13
- **\( f_{LC} \):** Exhibit 11-9
- **\( f_p \):** Page 11-18
- **TRD:** Page 11-11
- **LOS, S, FFS, v_p:** Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

### Flow Inputs
- **Volume, V**: 3516 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**:
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{E_R}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \)

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS
- \( f_{LW} \)
- \( f_{LC} \)
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

### LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} x f_p)} \) pc/h/ln
  - \( S \) 54.9 mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - **LOS**: D

### Design (N)
- **Design LOS**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} x f_p)} \) pc/h/ln
  - **Required Number of Lanes, N**: pc/mi/ln

### Glossary
- **N** - Number of lanes
- **V** - Hourly volume
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

### Factor Location
- **E_R** - Exhibits 11-10, 11-12
- **f_{LW}** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11

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### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: SR-91/Eastbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

### Flow Inputs
- **Volume, V**: 8037 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %Trucks and Buses
- **Peak-Hr Direction Prop, D**: %RVs
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **f_T**: 1.5
  \[ f_{HV} = \frac{1}{f_p[1+P_T(E_T - 1) + P_R(E_R - 1)]} \]

### Speed Inputs
- **Lane Width**: ft
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  \[ v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV} \times f_p)} \]
- **LOS**: C

### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **V_p** - Flow rate
- **FFS** - Free-flow speed
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume

---

**Calculate Speed Adj and FFS**

- **Design (N)**
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

---

**Factor Location**

- **E_R - Exhibits 11-10, 11-12**: f_LW - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_LC - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: SR-91/Westbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

## Flow Inputs
- **Volume, V**: 10121 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **f_HV** = \(\frac{1}{f_p(1+\frac{E_T}{P_T} - 1) + \frac{P_R(E_R - 1)}{1.000}}\)

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 6
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

## LOS and Performance Measures
- **Operational (LOS)**:
  - \(v_p = \frac{V}{N \times f_HV \times f_p}\) pc/h/ln
  - %Speed
  - %Density
  - pc/h/ln
- **Design (N)**
  - Design LOS
  - Design (N)
  - Design FFS
  - pc/h/ln
  - pc/mi/ln

## Glossary
- **N - Number of lanes**: S - Speed
- **V - Hourly volume**: D - Density
- **V_p - Flow rate**: FFS - Free-flow speed
- **LOS - Level of service**: BFFS - Base free-flow speed
- **DDHV - Directional design hour volume**

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: PM Peak Hour
- Project Description: YTI Project - Port of Los Angeles
- Highway/Direction of Travel: I-110/Northbound
- From/To: South of C St
- Jurisdiction: CALTRANS
- Analysis Year: 2026 NEPA Baseline

### Site Information
- Site Information:
- Parking
- QDOLW
- RA
- +LJKZD'LUHFWLRQRI7UDYHO
- $I-110/Northbound
- JHQFRU&RPSDQ
- (Raju Associates)
- )URP7R
- South of C St
- DWH3HUIRUPHG
- 8/6/2013
- )URP7R
- CALTRANS
- $QDOVLV7LPH3HULRG
- PM Peak Hour
- 2026 NEPA Baseline

### Flow Inputs
- Volume, V:
- 5235 veh/h
- Peak-Hour Factor, PHF: 0.94
- AADT:
- 2026 NEPA Baseline
- Peak-Hr Prop. of AADT, K:
- 0
- Peak-Hr Direction Prop, D:
- General Terrain: Level
- DDHV = AADT x K x D:
- veh/h

### Calculate Flow Adjustments
- f_p:
- 1.00
- E_T:
- 1.5
- f_{HV} = \frac{1}{1 + P_T(f_p - 1) + P_R(E_T - 1)}
- 1.00

### Speed Inputs
- Lane Width:
- ft
- Rt-Side Lat. Clearance:
- ft
- Number of Lanes, N:
- 4
- Total Ramp Density, TRD:
- ramps/mi
- FFS (measured):
- 65.0 mph
- BFFS:
- mph

### Calc Speed Adj and FFS
- f_{LW}:
- mph
- f_{LC}:
- mph
- TRD Adjustment:
- mph
- FFS:
- 65.0 mph

### LOS and Performance Measures
- Operational (LOS):
- v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)
- 1392 pc/h/ln
- S:
- 65.0 mph
- D:
- 21.4 pc/mi/ln
- LOS:
- C

### Design (N)
- Design LOS:
- v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)
- pc/h/ln
- S:
- mph
- D:
- pc/mi/ln
- Required Number of Lanes, N

### Glossary
- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- v_p - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- BFFS - Base free-flow speed
- DDHV - Directional design hour volume

### Factor Location
- E_R - Exhibits 11-10, 11-12
- f_{LW} - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_{LC} - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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**BASIC FREEWAY SEGMENTS WORKSHEET**

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<td>RA</td>
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<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
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<td>%Trucks and Buses, P_T</td>
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<td>Peak-Hr Direction Prop, D</td>
<td>%RVs, P_R</td>
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<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
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<td>Peak-Hour Factor, PHF</td>
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<td>%Trucks and Buses, P_T</td>
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<tr>
<td>%RVs, P_R</td>
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<th>Calculate Flow Adjustments</th>
<th>Calculate Flow Adjustments</th>
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<td>f_p</td>
<td>1.00</td>
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<tr>
<td>E_T</td>
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<tr>
<td>E_R</td>
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<tr>
<td>f_HV = 1/(1+P_T(E_T - 1) + P_R(E_R - 1))</td>
<td>1.000</td>
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<thead>
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<th>Speed Inputs</th>
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<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
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<tr>
<td>Number of Lanes, N</td>
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<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
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<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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<th>Speed Inputs</th>
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<tbody>
<tr>
<td>f_LW</td>
<td>mph</td>
</tr>
<tr>
<td>f_LC</td>
<td>mph</td>
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<tr>
<td>TRD Adjustment</td>
<td>mph</td>
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<tr>
<td>FFS</td>
<td>65.0 mph</td>
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<tr>
<th>LOS and Performance Measures</th>
<th>Design (N)</th>
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<tr>
<td>Operational (LOS)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
<td>v_p = (V or DDHV) / (PHF x N x f_HV x f_p)</td>
</tr>
<tr>
<td>S</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>pc/kr/ln</td>
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<td>LOS</td>
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<th>LOS and Performance Measures</th>
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<td>Design LOS</td>
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<td>Required Number of Lanes, N</td>
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<table>
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<tr>
<th>Glossary</th>
<th>Factor Location</th>
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<tbody>
<tr>
<td>N - Number of lanes</td>
<td>E_R - Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>V - Hourly volume</td>
<td>E_T - Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>f_p - Page 11-18</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td>TRD - Page 11-11</td>
</tr>
</tbody>
</table>

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-405/Northbound
- **From/To**: At Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

## Flow Inputs
- **Volume, V**: 9934 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- **f_p = 1.00**
- **E_T = 1.5**
- **E_R = 1.2**
- **f_{HV} = \frac{1}{1 + 0.5(1 - E_R)} + 0.5(E_R - 1) = 1.000**

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/MI
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV})} \times f_p \)
  - \( S = 57.8 \text{ mph} \)
  - \( D = \frac{v_p}{S} = 36.6 \text{ pc/mi/ln} \)
  - \( LOS = E \)

## Design (N)
- **Design LOS**
  - \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV})} \times f_p \)
  - \( S = \text{ mph} \)
  - \( D = \frac{v_p}{S} = \text{ pc/mi/ln} \)
  - \( LOS = E \)

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **f_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

## Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_{HV}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-405/Southbound
- **From/To**: At Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

#### Flow Inputs
<table>
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<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Volume, V</td>
<td>13025 veh/h</td>
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<tr>
<td>AADT</td>
<td>veh/day</td>
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</tbody>
</table>
| Peak-Hr Prop. of AADT, K | % RVs, P
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | veh/h |

#### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + f_p(E_T - 1)} + P_T(E_T - 1) \)

#### Speed Inputs
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
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<td>FFS (measured)</td>
<td>65.0 mph</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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</table>

#### LOS and Performance Measures

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

#### Factor Location
- \( E_R \): Exhibits 11-10, 11-12
- \( f_{LV} \): Exhibit 11-8
- \( E_T \): Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \): Exhibit 11-9
- \( f_p \): Page 11-18
- **LOS, S, FFS, V_p**: Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<th>RA</th>
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<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
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## Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | At Alondra Bl |
| Jurisdiction | CALTRANS |
| Analysis Year | 2026 NEPA Baseline |

## Project Description

YTI Project - Port of Los Angeles

## Flow Inputs

| Volume, V | 9036 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | % |
| Peak-Hr Direction Prop, D | % |

### Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \times 1.00 \]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## LOS and Performance Measures

### Operational (LOS)

\[ v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \]
\[ S = \frac{1923}{61.1} \text{ pc/h/ln} \]
\[ D = \frac{v_p}{S} \]

### Design (N)

\[ v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \]
\[ S = \frac{1923}{61.1} \text{ pc/h/ln} \]
\[ D = \frac{v_p}{S} \]

## Glossary

| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| \( v_p \) - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume |

## Factor Location

| \( E_R \) - Exhibits 11-10, 11-12 | \( f_{LV} \) - Exhibit 11-8 |
| \( E_T \) - Exhibits 11-10, 11-11, 11-13 | \( f_{LC} \) - Exhibit 11-9 |
| \( f_p \) - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3 | |

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## Flow Inputs

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<th>Parameter</th>
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<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ E_R = 1.2 \]
\[ f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1)) \]

## Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

### Operational (LOS)

\[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \]
\[ S = \frac{v_p}{63.9} \text{ mph} \]
\[ D = \frac{v_p}{S} \text{ pc/mi/ln} \]

### Design (N)

\[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \]
\[ S = \frac{v_p}{63.9} \text{ mph} \]
\[ D = \frac{v_p}{S} \text{ pc/mi/ln} \]

## Glossary

- N: Number of lanes
- V: Hourly volume
- D: Density
- f_p: Flow rate
- LOS: Level of service
- DDHV: Directional design hour volume
- E_R: Exhibits 11-10, 11-12
- f_{LV}: Exhibit 11-8
- E_T: Exhibits 11-11, 11-13
- f_{LC}: Exhibit 11-9
- TRD: Page 11-18
- LOS, S, FFS, v_p: Exhibits 11-2, 11-3

---

**Site Information**

- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: PM Peak Hour
- Project Description: YTI Project - Port of Los Angeles
- Highway/Direction of Travel: I-710/Southbound
- From/To: At Alondra Bl
- Jurisdiction: CALTRANS
- Analysis Year: 2026 NEPA Baseline

---

**General Information**

- Oper.(LOS)
- Des.(N)
- Planning Data

---

**Factor Location**

- E_R: Exhibits 11-10, 11-12
- f_{LV}: Exhibit 11-8
- E_T: Exhibits 11-11, 11-13
- f_{LC}: Exhibit 11-9
- TRD: Page 11-18
- LOS, S, FFS, v_p: Exhibits 11-2, 11-3
# BASIC FREEWAY WORKSHEET

## General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: PM Peak Hour
- Project Description: YTI Project - Port of Los Angeles

## Site Information
- Highway/Direction of Travel: I-710/Northbound
- From/To: Between I-405 & Del Amo
- Jurisdiction: CALTRANS
- Analysis Year: 2026 NEPA Baseline

## Flow Inputs
- Volume, V: 8449 veh/h
- AADT: 8449 veh/day
- Peak-Hr Prop. of AADT, K: 0
- Peak-Hr Direction Prop, D: 1
- DDHV = AADT x K x D: veh/h

## Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)

## Speed Inputs
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 4
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 55.0 mph
- Base free-flow Speed, BFFS: mph

## LOS and Performance Measures
- Operational (LOS) \( v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{PHV} \times f_p) \)
- LOS: E

## Glossary
- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

## Factor Location
- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{PC} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{PC} \) - Exhibit 11-9
- TRD - Page 11-11
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
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<td>From/To Between I-405 &amp; Del Amo BI</td>
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<td>Project Description</td>
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## Site Information

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## Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>7120 veh/h</th>
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<tr>
<td>AADT</td>
<td>veh/day</td>
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<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, $P_T$ = 0.94</td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%RVs, $P_R$ = 0</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
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## Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>$f_p$</th>
<th>1.00</th>
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</thead>
<tbody>
<tr>
<td>$E_T$</td>
<td>1.5</td>
</tr>
<tr>
<td>$E_R$</td>
<td>1.2</td>
</tr>
<tr>
<td>$f_HV = \frac{1}{[f_p^T(E_T - 1) + P_R(E_R - 1)]}$</td>
<td>1.000</td>
</tr>
</tbody>
</table>

## Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_p = \frac{(V \text{ or } DDHV) \times (PHF \times N \times f_{HV})}{x f_p}$</td>
<td>Design LOS</td>
</tr>
<tr>
<td>$S$</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>$D = \frac{V_p}{S}$</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>$DOS = D$</td>
<td>pc/mi/ln</td>
</tr>
</tbody>
</table>

## Glossary

- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **$V_p$** - Flow rate
- **$f_p$** - Flow factor
- **LOS** - Level of service
- **DDHV** - Directional design hour volume
- **FFS** - Free-flow speed
- **BFFS** - Base free-flow speed
- **$E_R$** - Exhibits 11-10, 11-12, 11-8
- **$f_{LVW}$** - Exhibit 11-8
- **$E_T$** - Exhibits 11-11, 11-13
- **$f_{LC}$** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, $V_p$** - Exhibits 11-2, 11-3

---

**Factor Location**

- **HCS 2010™ Version 6.50**
- **Generated: 2/5/2014 3:00 PM**

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file:///C:/TEMP/f2k8987.tmp
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** Between PCH & Willow St
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 NEPA Baseline
- **Oper.(LOS):**

## Flow Inputs
- **Volume, V:** 6269 veh/h
- **AADT:**
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h

## Calculate Flow Adjustments
- **f_p:** 1.00
- **E_R:** 1.2
- **E_T:** 1.5
- **f_{HV} = \frac{1}{(1 + P_T(E_R - 1)) + P_R(E_R - 1)}:** 1.000

## Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 3
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed:** mph

## Los and Performance Measures
- **Operational (LOS):**
- **v_p = \frac{(V or DDHV) \times f_{HV}}{(PHF \times N \times f_HV)}:** pc/h/ln
- **S:** 50.6 mph
- **D:** 43.9 pc/mi/ln
- **LOS:**

## Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **v_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_{LV} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LT} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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**HCS 2010™ Version 6.50**

**Generated:** 2/5/2014 3:00 PM

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### BASIC FREEWAY WORKSHEET

#### General Information

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<td>RA</td>
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<td>PM Peak Hour</td>
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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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#### Site Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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<tbody>
<tr>
<td>Highway/Direction of Travel</td>
<td>I-710/Southbound</td>
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<tr>
<td>From/To</td>
<td>Between PCH &amp; Willow St</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 NEPA Baseline</td>
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</table>

#### Flow Inputs

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Volume, V (veh/h)</td>
<td>6318</td>
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<tr>
<td>AADT, veh/day</td>
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<tr>
<td>Peak-Hr Prop. of AADT, K</td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
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</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{(1 + P_T) (E_T - 1) + P_R (E_R - 1)} \times 1.000 \)

#### Speed Inputs

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
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</table>

#### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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</thead>
<tbody>
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<td>Speed Input</td>
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<tr>
<td>Calc Speed Adj</td>
<td></td>
</tr>
<tr>
<td>FFS</td>
<td>55.0</td>
</tr>
</tbody>
</table>

#### LOS and Performance Measures

- Operational (LOS)
  \[ v_p = \frac{(V \text{ or } DDHV) \times (PHF \times N \times f_{HV})}{2240} \] pc/h/ln
  \[ S = \frac{50.2 \text{ mph}}{D = \frac{v_p}{S} \frac{44.6 \text{ pc/mi/ln}}{LOS = E}} \]

- Design (N)
  \[ v_p = \frac{(V \text{ or } DDHV) \times (PHF \times N \times f_{HV})}{2240} \] pc/h/ln
  \[ D = \frac{v_p}{S} \frac{44.6 \text{ pc/mi/ln}}{LOS = E} \]

#### Glossary

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Number of lanes</td>
<td></td>
</tr>
<tr>
<td>V - Hourly volume</td>
<td></td>
</tr>
<tr>
<td>( v_p ) - Flow rate</td>
<td></td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td></td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

#### Factor Location

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( E_R ) - Exhibits 11-10, 11-12</td>
<td></td>
</tr>
<tr>
<td>( f_{LV} ) - Exhibit 11-8</td>
<td></td>
</tr>
<tr>
<td>( E_T ) - Exhibits 11-10, 11-11, 11-13</td>
<td></td>
</tr>
<tr>
<td>( f_{LC} ) - Exhibit 11-9</td>
<td></td>
</tr>
<tr>
<td>( f_p ) - Page 11-18</td>
<td></td>
</tr>
<tr>
<td>TRD - Page 11-11</td>
<td></td>
</tr>
<tr>
<td>LOS, S, FFS, ( v_p ) - Exhibits 11-2, 11-3</td>
<td></td>
</tr>
</tbody>
</table>
**BASIC FREEWAY SEGMENTS WORKSHEET**

**General Information**
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

**Site Information**
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

**Project Description**: YTI Project - Port of Los Angeles

**Oper.(LOS)**

<table>
<thead>
<tr>
<th><strong>Flow Inputs</strong></th>
<th><strong>Site Information</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volume, V</strong></td>
<td>7514 veh/h</td>
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<tr>
<td><strong>AADT</strong></td>
<td>veh/day</td>
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<tr>
<td><strong>Peak-Hr Prop. of AADT, K</strong></td>
<td>%</td>
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<td><strong>Peak-Hr Direction Prop, D</strong></td>
<td>%</td>
</tr>
<tr>
<td><strong>DDHV = AADT x K x D</strong></td>
<td>veh/h</td>
</tr>
</tbody>
</table>

**Calculate Flow Adjustments**

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1+P_T(E_T - 1)} + P_R(E_R - 1) \)

**Speed Inputs**

<table>
<thead>
<tr>
<th><strong>Speed Inputs</strong></th>
<th><strong>Calc Speed Adj and FFS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lane Width</strong></td>
<td>ft</td>
</tr>
<tr>
<td><strong>Rt-Side Lat. Clearance</strong></td>
<td>ft</td>
</tr>
<tr>
<td><strong>Number of Lanes, N</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>Total Ramp Density, TRD</strong></td>
<td>ramps/mi</td>
</tr>
<tr>
<td><strong>FFS (measured)</strong></td>
<td>65.0 mph</td>
</tr>
<tr>
<td><strong>Base free-flow Speed, BFFS</strong></td>
<td>mph</td>
</tr>
</tbody>
</table>

**LOS and Performance Measures**

**Operational (LOS)**

\[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_HV)} \times f_p \]

- **Design (N)**

**Glossary**

- **V** - Hourly volume
- **N** - Number of lanes
- **D** - Density
- **LOS** - Level of service
- **DDHV** - Directional design hour volume
- **BFFS** - Base free-flow speed
- **FFS** - Free-flow speed
- **PHF** - Peak-Hour Factor
- **P_T** - Trucks and Buses
- **P_R** - RVs
- **E_T** - Exits 11-10, 11-12
- **E_R** - Exhibits 11-10, 11-12
- **f_p** - Page 11-18
- **f_LW** - Exhibit 11-8
- **f LC** - Exhibit 11-9
- **TRD** - Page 11-11

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### Basic Freeway Segments Worksheet

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** North of Florence Av
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 NEPA Baseline

#### Site Information
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, P_T:** 0
- **General Terrain:** Level
- **Grade %:**
- **Length mi:**
- **Up/Down %:**

#### Flow Inputs
- **Volume, V:** 8733 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h

#### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_R:** 1.2
- **E_T:** 1.5
- **f_{HV} = 1/(1+P_T(E_R - 1)) + P_T(E_R - 1) = 1.000**

#### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

#### Calc Speed Adj and FFS
- **Calc Speed Adj:**
  - **f_LW:** mph
  - **f_{LC}:** mph
- **TRD Adjustment:** mph
- **FFS:** 65.0 mph

#### LOS and Performance Measures
- **Operational (LOS):**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV})**
  - **S:** 52.9 mph
  - **D = v_p / S:** 43.9 pc/mi

#### Design (N)
- **Design LOS:**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV})**
  - **S:** mph
  - **D = v_p / S:** pc/mi

#### Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **f_p:** Flow rate
- **FFS:** Free-flow speed
- **LOS:** Level of service
- **BFFS:** Base free-flow speed
- **DDHV:** Directional design hour volume

#### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_{IV} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<tr>
<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
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<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
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## Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | n/o I-105 and n/o Firestone |
| Jurisdiction | CALTRANS |
| Analysis Year | 2026 NEPA Baseline |

## Project Description

YTI Project - Port of Los Angeles

<table>
<thead>
<tr>
<th>Oper.(LOS)</th>
<th>Des.(N)</th>
<th>Planning Data</th>
</tr>
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<tbody>
<tr>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Flow Inputs

| Volume, V | 8228 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | % |
| Peak-Hr Direction Prop, D | |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

| f<sub>p</sub> | 1.00 |
| E<sub>T</sub> | 1.5 |
| EF<sub>HV</sub> = 1/(1 + P<sub>T</sub>(E<sub>T</sub> - 1) + P<sub>R</sub>(E<sub>R</sub> - 1)) | 1.00 |

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## Calc Speed Adj and FFS

| f<sub>LW</sub> | |
| f<sub>LC</sub> | |
| TRD Adjustment | |
| FFS | 65.0 mph |

## LOS and Performance Measures

| Operational (LOS) | Design (N) |
| v<sub>p</sub> = (V or DDHV) / (PHF x N x f<sub>HV</sub>) | v<sub>p</sub> = (V or DDHV) / (PHF x N x f<sub>HV</sub>) |
| S | 56.2 mph |
| D = v<sub>p</sub> / S | 38.9 pc/mi/ln |
| LOS | E |

## Glossary

| N | Number of lanes |
| V | Hourly volume |
| v<sub>p</sub> | Flow rate |
| LOS | Level of service |
| DDHV | Directional design hour volume |

| E<sub>R</sub> | Exhibits 11-10, 11-12 |
| f<sub>LW</sub> | Exhibit 11-8 |
| E<sub>T</sub> | Exhibits 11-10, 11-11, 11-13 |
| f<sub>LC</sub> | Exhibit 11-9 |
| f<sub>p</sub> | Page 11-18 |
| LOS, S, FFS, v<sub>p</sub> | Exhibits 11-2, 11-3 |

## Factor Location

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---

2/5/2014
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: I-105 & n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

### Flow Inputs
- **Volume, V**: 9041 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %Trucks and Buses, \( P_T \)
- **Peak-Hr Direction Prop, D**: %RVs, \( P_R \)
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- \( f_p \) = 1.00
- \( E_T \) = 1.5
- \( E_R \) = 1.2
- \( f_{HV} = \frac{1}{1 + P_T(E_T - 1)} + P_R(E_R - 1) \) = 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \)
- \( S \) = 50.7 mph
- \( D = \frac{v_p}{S} \)
- \( LOS \) = \( F \)

### Design (N)
- **Design LOS**
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \)
- \( S \) = mph
- \( D = \frac{v_p}{S} \)
- **Required Number of Lanes, N**

### Glossary
- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

---

**Oper.(LOS)**  □ Des.(N)  □ Planning Data

---

**Calculations**

\( f_{HV} = \frac{1}{1 + P_T(E_T - 1)} + P_R(E_R - 1) \) = 1.000

---

**Factor Location**

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{HV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_p \) - Page 11-18
- \( TRD \) - Page 11-11

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</tr>
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<td>Raju Associates</td>
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<td>YTI Project - Port of Los Angeles</td>
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<td>Oper.(LOS)</td>
<td>Des.(N)</td>
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<tr>
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<td>2281 veh/day</td>
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<td>%Trucks and Buses, P_T 0.94</td>
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<td>Peak-Hr Direction Prop, D</td>
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<td>veh/h Grade % Length Up/Down %</td>
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<th><strong>Calc Speed Adj and FFS</strong></th>
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<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
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<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
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<tr>
<td>FFS (measured)</td>
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</tr>
<tr>
<td>Base free-flow Speed</td>
<td>mph</td>
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<th><strong>Design (N)</strong></th>
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<td>Operational (LOS)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_hv x f_p)</td>
<td>v_p = (V or DDHV) / (PHF x N x f_hv x f_p)</td>
</tr>
<tr>
<td>S 55.0 mph</td>
<td>S mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>D pc/mi/ln</td>
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<tr>
<td>LOS B</td>
<td>Required Number of Lanes, N</td>
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<tr>
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<th><strong>Factor Location</strong></th>
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<tr>
<td>N - Number of lanes</td>
<td>S - Speed</td>
</tr>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>v_p - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
<tr>
<td>E_R - Exhibits 11-10, 11-12</td>
<td>f_LW - Exhibit 11-8</td>
</tr>
<tr>
<td>E_T - Exhibits 11-10, 11-11, 11-13</td>
<td>f_LC - Exhibit 11-9</td>
</tr>
<tr>
<td>f_p - Page 11-18</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
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</table>
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<tr>
<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
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## Site Information

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<th>Highway/Direction of Travel</th>
<th>SR-47/Southbound</th>
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<tr>
<td>From/To</td>
<td>at Cdre. Schuyler Heim Bridge</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 NEPA Baseline</td>
</tr>
</tbody>
</table>

## Project Description

- Oper.(LOS) - Port of Los Angeles
- Des.(N)
- Planning Data

## Flow Inputs

| Volume, V | 1928 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5 |

| E_R | 1.2 |
| f_HV | \( \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \) |

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 3 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 55.0 mph |
| Base free-flow Speed, BFFS | mph |

## Calc Speed Adj and FFS

| f_LW | mph |
| f_LC | mph |
| TRD Adjustment | mph |
| FFS | 55.0 mph |

## LOS and Performance Measures

| v_p = (V or DDHV) / (PHF x N x f_HV x f_p) | 684 pc/h/ln |
| S | 55.0 mph |
| D = v_p / S | 12.4 pc/mi/ln |
| LOS | B |

## Design (N)

| Design LOS |
| v_p = (V or DDHV) / (PHF x N x f_HV x f_p) | pc/h/ln |
| S | mph |
| D = v_p / S | pc/mi/ln |
| Required Number of Lanes, N |

## Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

## Factor Location

- E_R - Exhibits 11-10, 11-12
- f_LW - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_LC - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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2/5/2014
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

#### Site Information
- **Highway/Direction of Travel**: SR-47/Eastbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

#### Project Description
- **YTI Project - Port of Los Angeles**

#### Flow Inputs
- **Volume, V**: 4223 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0

#### Calculate Flow Adjustments
\[
f_p = 1.00 \quad E_R = 1.2
\]
\[
E_T = 1.5 \quad f_{HV} = \frac{1}{(1 + P_T (E_T - 1)) + P_R (E_R - 1)} \cdot 1.000
\]

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures

#### Design (N)

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 NEPA Baseline

## Site Information
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade**: 0%
- **Length**: mi
- **Up/Down %**:

## Flow Inputs
- **Volume, V**: 3406 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: 0
- **Peak-Hr Direction Prop, D**: 0
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **f_HV = 1/(1+P_T(E_R - 1) + P_R(E_R - 1))**: 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

## Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

## LOS and Performance Measures
- **LOS**: Design (N)
- **Operational (LOS)**:
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \)
  - \( \frac{1812}{S} \text{ pc/h/ln} \)
  - \( \frac{55.0}{D} \text{ mph} \)
  - \( \frac{32.9}{D} \text{ pc/mi/ln} \)
- **Required Number of Lanes, N**

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_LW - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_LC - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
## Basic Freeway Segments Worksheet

### General Information

**Analyst:** RA  
**Agency or Company:** Raju Associates  
**Date Performed:** 8/6/2013  
**Analysis Time Period:** PM Peak Hour  
**Project Description:** YTI Project - Port of Los Angeles

### Site Information

**Highway/Direction of Travel:** SR-91/Eastbound  
**From/To:** East of Alameda St & Santa Fe  
**Jurisdiction:** CALTRANS  
**Analysis Year:** 2026 NEPA Baseline

### Site Information

- **Oper.(LOS)**  
- **Des.(N)**  
- **Planning Data**

### Flow Inputs

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<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, ( V )</td>
<td>7271 veh/h</td>
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<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, ( K )</td>
<td>%Trucks and Buses, ( P_T )</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, ( D )</td>
<td>%RVs, ( P_R )</td>
</tr>
<tr>
<td>DDHV = AADT ( x ) K ( x ) D</td>
<td>veh/h</td>
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### Flow Inputs

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<tr>
<td>%Trucks and Buses, ( P_T )</td>
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<tr>
<td>%RVs, ( P_R )</td>
<td>0</td>
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### Calculate Flow Adjustments

- **\( f_p \)** 1.00  
- **\( E_R \)** 1.2  
- **\( E_T \)** \( \frac{1}{1+P_T(E_T-1)+P_R(E_R-1)} \) 1.00

### Flow Inputs

<table>
<thead>
<tr>
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<th>Value</th>
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<tr>
<td>Lane Width</td>
<td>ft</td>
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<tr>
<td>Number of Lanes, ( N )</td>
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<tr>
<td>Total Ramp Density, ( TRD )</td>
<td>ramps/mi</td>
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<tr>
<td>Base free-flow Speed, ( BFFS )</td>
<td>mph</td>
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### Speed Inputs

<table>
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<tr>
<td>f_{LW}</td>
<td>mph</td>
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<tr>
<td>f_{LC}</td>
<td>mph</td>
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### Speed Inputs

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<td>Design (N)</td>
<td>Design LOS</td>
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### LOS and Performance Measures

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### Glossary

- **N** - Number of lanes  
- **V** - Hourly volume  
- **D** - Density  
- **p** - Flow rate  
- **LOS** - Level of service  
- **BFFS** - Base free-flow speed  
- **DDHV** - Directional design hour volume

### Factor Location

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>( E_R ) - Exhibits 11-10, 11-12</td>
<td>( f_{LW} ) - Exhibit 11-8</td>
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<tr>
<td>( E_T ) - Exhibits 11-10, 11-11, 11-13</td>
<td>( f_{LC} ) - Exhibit 11-9</td>
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<tr>
<td>( f_p ) - Page 11-18</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, ( v_p ) - Exhibits 11-2, 11-3</td>
<td>Ingredients: 11-4, 11-5</td>
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### General Information

**Analyst** RA  
**Agency or Company** Raju Associates  
**Date Performed** 8/6/2013  
**Analysis Time Period** PM Peak Hour  
**Project Description** YTI Project - Port of Los Angeles  
**Highway/Direction of Travel** SR-91/Westbound  
**From/To** East of Alameda St & Santa Fe  
**Jurisdiction** CALTRANS  
**Analysis Year** 2026 NEPA Baseline  

### Site Information

- **Peak-Hour Factor, PHF** 0.94  
- **%Trucks and Buses, P_T** 0  
- **%RVs, P_R** 0  
- **General Terrain:** Level  
- **Grade** %  
- **Length** mi  
- **Up/Down %**

### Flow Inputs

- **Volume, V** 9358 veh/h  
- **AADT** veh/day  
- **Peak-Hr Prop. of AADT, K**  
- **Peak-Hr Direction Prop, D**  
- **DDHV = AADT x K x D** veh/h

### Calculate Flow Adjustments

- **f_p** 1.00  
- **E_R** 1.2  
- **E_T** 1.5  
- **f_HV = 1/[f_p(E_T - 1) + P_R(E_R - 1)] 1.000**

### Speed Inputs

- **Lane Width** ft  
- **Rt-Side Lat. Clearance** ft  
- **Number of Lanes, N** 6  
- **Total Ramp Density, TRD** ramps/mi  
- **FFS (measured)** 65.0 mph  
- **Base free-flow Speed, BFFS**

### Calc Speed Adj and FFS

- **f_LW** mph  
- **f_LC** mph  
- **TRD Adjustment** mph  
- **FFS** 65.0 mph

### LOS and Performance Measures

**Operational (LOS)**

- **v_p = (V or DDHV) / (PHF x N x f_{HV}) 1659 pc/h/mi**
- **S** 64.0 mph  
- **D = v_p / S 25.9 pc/mi**
- **LOS C**

**Design (N)**

- **Design LOS**
- **v_p = (V or DDHV) / (PHF x N x f_{HV}) pc/h/mi**
- **S** mph  
- **D = v_p / S pc/mi**

**Required Number of Lanes, N**

### Glossary

- **N** - Number of lanes  
- **S** - Speed  
- **V** - Hourly volume  
- **D** - Density  
- **v_p** - Flow rate  
- **FFS** - Free-flow speed  
- **LOS** - Level of service  
- **BFFS** - Base free-flow speed  
- **DDHV** - Directional design hour volume

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2026 PROPOSED PROJECT

AM/PM PEAK HOURS
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Jurisdiction**: CALTRANS
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-110/Northbound
- **From/To**: South of C St
- **Analysis Year**: 2026 Proposed Project

### Flow Inputs
| Volume, V | 6392 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT     | veh/day    | %Trucks and Buses, \( P_T \) | 0   |
| Peak-Hr Prop. of AADT, \( K \) | %RVs, \( P_R \) | 0 |
| Peak-Hr Direction Prop, \( D \) | General Terrain: | Level |
| DDHV = AADT x K x D | veh/h | Grade | % |
|          |           | Length | mi |
|          |           | Up/Down | % |

### Calculate Flow Adjustments
- \( f_p \) = 1.00
- \( E_T \) = 1.5
- \( f_{HV} = \frac{1}{E_T} \times (E_T - 1) + P_R (E_T - 1) \)

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, \( N \)**: 4
- **Total Ramp Density, TRD (ramps/mi)**: 
- **FFS (measured)**: 65.0 mph
- **Base free-flow speed, BFFS**: mph

### LOS and Performance Measures
<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} )</td>
<td>( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} )</td>
</tr>
<tr>
<td>( S ) = ( v_p / S )</td>
<td>( S ) = ( v_p / S )</td>
</tr>
<tr>
<td>LOS ( D )</td>
<td>Required Number of Lanes, ( N )</td>
</tr>
</tbody>
</table>

### Glossary
- **\( N \)** - Number of lanes
- **\( V \)** - Hourly volume
- **\( v_p \)** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume
- **\( S \)** - Speed
- **D** - Density
- **FFS** - Free-flow speed
- **BFFS** - Base free-flow speed

### Factor Location
- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel:** I-110/Southbound
- **From/To:** South of C St
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 Proposed Project

#### Flow Inputs
- **Volume, V:** 4492 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h

#### Calculate Flow Adjustments
- **\( f_p \):** 1.00
- **\( E_T \):** 1.5
- **\( E_R \):** 1.2
- **\( f_{HV} = \frac{1}{1 + \phi (E_T - 1)} + \phi (E_R - 1) \):** 1.00

#### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

#### LOS and Performance Measures
- **Operational (LOS):**
  - **\( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \):** 1195 pc/h/ln
  - **S:** 65.0 mph
  - **D = v_p / S:** 18.4 pc/mi/ln
- **LOS:** C

#### Design (N)
- **Design LOS**
  - **\( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \):** pc/h/ln
  - **S:** mph
  - **D = v_p / S:** pc/mi/ln

#### Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **\( v_p \):** Flow rate
- **LOS:** - Level of service
- **DDHV:** - Directional design hour volume

#### Factor Location
- **\( E_R \) - Exhibits 11-10, 11-12**
- **\( f_{LV} \) - Exhibit 11-8**
- **\( E_T \) - Exhibits 11-10, 11-11, 11-13**
- **\( f_{LC} \) - Exhibit 11-9**
- **\( f_p \) - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3**

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information | Site Information
--- | ---
**Analyst** | RA
**Agency or Company** | Raju Associates
**Date Performed** | 8/6/2013
**Analysis Time Period** | AM Peak Hour
**Project Description** | YTI Project - Port of Los Angeles

### Flow Inputs

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<th>Value</th>
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<td>Volume, V</td>
<td>12796 veh/h</td>
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<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%RVs, P_R</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain: Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
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</table>

### Calculate Flow Adjustments

<table>
<thead>
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<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>f_p</td>
<td>1.00</td>
</tr>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
<tr>
<td>E_R</td>
<td>1.2</td>
</tr>
</tbody>
</table>

### Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>RT-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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</table>

### LOS and Performance Measures

**Operational (LOS)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p )</td>
<td>( (V \text{ or } DDHV) / (PHF \times N \times f_{HV}x f_p) )</td>
</tr>
<tr>
<td>S</td>
<td>40.2 mph</td>
</tr>
<tr>
<td>D</td>
<td>( v_p / S )</td>
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<tr>
<td>LOS</td>
<td>F</td>
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**Design (N)**

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<thead>
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<th>Value</th>
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<tr>
<td>Design LOS</td>
<td>Design (N)</td>
</tr>
<tr>
<td>( v_p )</td>
<td>( (V \text{ or } DDHV) / (PHF \times N \times f_{HV}x f_p) )</td>
</tr>
<tr>
<td>S</td>
<td>mph</td>
</tr>
<tr>
<td>D</td>
<td>( v_p / S )</td>
</tr>
</tbody>
</table>

### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **D**: Density
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **f_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed

### Factor Location

- **E_R**: Exhibits 11-10, 11-12
- **f_{LVW}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-405/Southbound
- **From/To**: at Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

## Flow Inputs
- **Volume, V**: 8892 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_{HV} = 1/[(1 + P_T(E_T - 1) + P_R(E_R - 1)]**: 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)**: 1892 pc/h/ln
  - **S**: 61.6 mph
  - **D = v_p / S**: 30.7 pc/mi/ln
  - **LOS**: 

## Speed Inputs
- **Calc Speed Adj and FFS**
  - **f_{LW}**
  - **f_{LC}**
  - **TRD Adjustment**: mph
  - **FFS**: 65.0 mph

## Glossary
- **N** - Number of lanes
- **V** - Hourly volume
- **v_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_{LV} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour

### Site Information
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** at Alondra Bl
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 Proposed Project

### Project Description
- **YTI Project - Port of Los Angeles**

### Flow Inputs
- **Volume, V:** 8128 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_T:** 1.5
- **E_R:** 1.2

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 5
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph

### LOS and Performance Measures
- **LOS:** Design (N)
- **Operational (LOS):**
- **Design LOS**

### Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **V_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume
- **FFS:** Free-flow speed
- **BFFS:** Base free-flow speed

### Factor Location
- **E_R:** Exhibits 11-10, 11-12
- **f_p:** Page 11-18
- **LOS, S, FFS, v_p:** Exhibits 11-2, 11-3
- **f_LW:** Exhibit 11-8
- **f_LC:** Exhibit 11-9
- **TRD:** Page 11-11

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<tr>
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<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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</tbody>
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## Site Information

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>I-710/Southbound</th>
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</thead>
<tbody>
<tr>
<td>From/To</td>
<td>at Alondra Bl</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 Proposed Project</td>
</tr>
</tbody>
</table>

## Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>10588 veh/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%RVs, P_R</td>
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<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain: Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments

\[ f_p \] = 1.00, \[ E_T \] = 1.5

\[ f_{HV} = \frac{1}{1 + \frac{E_T}{E_R}} + \frac{P_R(E_T - 1)}{E_R(E_T - 1)} \] = 1.000

## Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

## Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>Speed Input</th>
<th>Speed Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_{LW}</td>
<td>mph</td>
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<tr>
<td>f_{LC}</td>
<td>mph</td>
</tr>
<tr>
<td>TRD Adjustment</td>
<td>mph</td>
</tr>
<tr>
<td>FFS</td>
<td>65.0 mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV})} \times f_p ]</td>
<td>[ v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV})} \times f_p ]</td>
</tr>
<tr>
<td>S</td>
<td>pc/h ln</td>
</tr>
<tr>
<td>D</td>
<td>41.2 pc/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>pc/ln</td>
</tr>
</tbody>
</table>

## Glossary

- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed
- E_R - Exhibits 11-10, 11-12
- E_T - Exhibits 11-11, 11-13
- f_p - Page 11-18
- f_{LW} - Exhibit 11-8
- f_{LC} - Exhibit 11-9
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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<td>Raju Associates</td>
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<td>Project Description</td>
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<tr>
<td>Highway/Direction of Travel</td>
<td>I-710/Northbound</td>
</tr>
<tr>
<td>From/To</td>
<td>Between I-405 &amp; Del Amo BI</td>
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<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 Proposed Project</td>
</tr>
</tbody>
</table>

**Flow Inputs**

| Volume, V | 8758 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, PT |
| Peak-Hr Direction Prop, D | %RVs, PR |
| DDHV = AADT x K x D | veh/h |
| Grade | % |
| Length | mi |
| Up/Down | % |

**Calculate Flow Adjustments**

| f_p | 1.00 |
| E_T | 1.5 |
| E_R | 1.2 |
| f_HV = 1/[f_1 + P_T(E_T - 1) + P_R(E_R - 1)] | 1.000 |

**Speed Inputs**

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 55.0 mph |
| Base free-flow Speed, BFFS | mph |

**LOS and Performance Measures**

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>x f_p</td>
<td>v_p = (V or DDHV) / (PHF x N x f_HV)</td>
</tr>
<tr>
<td>x f_p</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>48.1 mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>mph</td>
</tr>
<tr>
<td>LOS</td>
<td>D = v_p / S</td>
</tr>
<tr>
<td>F</td>
<td>pc/mi/ln</td>
</tr>
</tbody>
</table>

**Glossary**

| N | Number of lanes |
| V | Hourly volume |
| V_p | Flow rate |
| LOS | Level of service |
| DDHV | Directional design hour volume |

For more information, please refer to the following:

- E_R - Exhibits 11-10, 11-12
- f_LW - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_LC - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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**BASIC FREEWAY WORKSHEET**

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<td>Analyst</td>
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<td>From/To</td>
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<td>Date Performed</td>
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- Oper.(LOS) | Des.(N) | Planning Data |

### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>AADT</th>
<th>Peak-Hour Factor, PHF</th>
<th>%Trucks and Buses, P_T</th>
</tr>
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<tbody>
<tr>
<td>9197 veh/h</td>
<td>veh/day</td>
<td>0.94</td>
<td>0</td>
</tr>
</tbody>
</table>

**Peak-Hr Prop. of AADT, K**

**Peak-Hr Direction Prop, D**

**DDHV = AADT x K x D**

<table>
<thead>
<tr>
<th>Flow Adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f_p )</td>
</tr>
<tr>
<td>( E_T )</td>
</tr>
</tbody>
</table>

\[
f_HV = \frac{1}{1 + \left( \frac{1}{E_T} - 1 \right) + \left( \frac{1}{E_R} - 1 \right)^{1.000}}
\]

### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

**Calc Speed Adj and FFS**

<table>
<thead>
<tr>
<th>( f_{LW} )</th>
<th>( f_{LC} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>mph</td>
<td>mph</td>
</tr>
</tbody>
</table>

**LOS and Performance Measures**

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}} \times f_p) )</td>
</tr>
<tr>
<td>( S )</td>
</tr>
<tr>
<td>( D = v_p / S )</td>
</tr>
<tr>
<td>LOS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design LOS</td>
</tr>
<tr>
<td>( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}} \times f_p) )</td>
</tr>
<tr>
<td>( S )</td>
</tr>
<tr>
<td>( D = v_p / S )</td>
</tr>
<tr>
<td>Required Number of Lanes, N</td>
</tr>
</tbody>
</table>

### Glossary

- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

**Factor Location**

- **E_R** - Exhibits 11-10, 11-12
- **f_{LW}** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3

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2/5/2014
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
</tbody>
</table>

### Site Information

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway/Direction of Travel</td>
<td>I-710/Northbound</td>
</tr>
<tr>
<td>From/To</td>
<td>Between PCH &amp; Willow St</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 Proposed Project</td>
</tr>
</tbody>
</table>

### Project Description

- YTI Project - Port of Los Angeles
- Oper.(LOS) - Port of Los Angeles

### Flow Inputs

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>7979 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%Trucks and Buses, P_T</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%RVs, P_R</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_p</td>
<td>1.00</td>
</tr>
<tr>
<td>E_T</td>
<td>1.5</td>
</tr>
</tbody>
</table>

### Speed Inputs

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td></td>
</tr>
<tr>
<td>Design (N)</td>
<td></td>
</tr>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_HV)</td>
<td>2829 pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>28.9 mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>98.0 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>F</td>
</tr>
</tbody>
</table>

### Glossary

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>v_p</td>
<td>Flow rate</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
</tr>
<tr>
<td>DDHV</td>
<td>Directional design hour volume</td>
</tr>
</tbody>
</table>

### Factor Location

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>E_R - Exhibits 11-10, 11-12</td>
<td>f_LW - Exhibit 11-8</td>
</tr>
<tr>
<td>E_T - Exhibits 11-10, 11-11, 11-13</td>
<td>f_LC - Exhibit 11-9</td>
</tr>
<tr>
<td>v_p - Page 11-18</td>
<td>TRD - Page 11-11</td>
</tr>
<tr>
<td>LOS, S, FFS, v_p - Exhibits 11-2, 11-3</td>
<td></td>
</tr>
</tbody>
</table>

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file:///C:/TEMP/f2kE74.tmp
**BASIC FREEWAY SEGMENTS WORKSHEET**

**General Information**
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: AM Peak Hour

**Site Information**
- Highway/Direction of Travel: I-710/Southbound
- From/To: Between PCH & Willow St
- Jurisdiction: CALTRANS
- Analysis Year: 2026 Proposed Project

**Project Description**
- YTI Project - Port of Los Angeles

**Flow Inputs**
- Volume, V: 8685 veh/h
- AADT: 8685 veh/day
- Peak-Hr Prop. of AADT, K:%
- Peak-Hr Direction Prop, D:
- DDHV = AADT x K x D: veh/h

**Calculate Flow Adjustments**
- \( f_p \): 1.00
- \( E_T \): 1.5
- \( f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \): 1.00

**Speed Inputs**
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 3
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 55.0 mph

**Calc Speed Adj and FFS**
- \( f_{LW} \): mph
- \( f_{LC} \): mph
- TRD Adjustment: mph
- FFS: 55.0 mph

**LOS and Performance Measures**
- Operational (LOS)
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \): pc/h/ln
- S: 14.5 mph
- D: \( \frac{v_p}{S} \): pc/mi/ln
- LOS: F

**Design (N)**
- Design LOS
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \): pc/h/ln
- S: mph
- D: \( \frac{v_p}{S} \): pc/mi/ln
- Required Number of Lanes, N

**Glossary**
- N: Number of lanes
- V: Hourly volume
- \( V_p \): Flow rate
- LOS: Level of service
- DDHV: Directional design hour volume

**Factor Location**
- \( E_R \): Exhibits 11-10, 11-12
- \( f_{LW} \): Exhibit 11-8
- \( E_T \): Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \): Exhibit 11-9
- \( f_p \): Page 11-18
- TRD: Page 11-11
- LOS, S, FFS, \( v_p \): Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

## Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

## Project Description
- **YTI Project - Port of Los Angeles**

## Oper.(LOS)

### Flow Inputs
- **Volume, V**: 9245 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = \{1 + P_T(E_T - 1) + P_R(E_R - 1)\} 1.000**

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**

#### Design (N)

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location
- **E_R - Exhibit**: 11-10, 11-12
- **f_{HW} - Exhibit**: 11-8
- **E_T - Exhibit**: 11-10, 11-11, 11-13
- **f_{LC} - Exhibit**: 11-9
- **f_p - Page**: 11-18
- **TRD - Page**: 11-11
- **LOS, S, FFS, v_p - Exhibits**: 11-2, 11-3

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file:///C:/TEMP/f2k7CAF.tmp
### BASIC FREEWAY SEGMENTS WORKSHEET

**General Information**
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour

**Site Information**
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

**Project Description**: YTI Project - Port of Los Angeles

**Oper.(LOS)**

### Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>7697 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>400 veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>0%</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Calculate Flow Adjustments**

- **Fp**: 1.00
- **ET**: 1.5
- **E_R**: 1.2
- **f_HV**: \( \frac{1}{\frac{1}{f_p} + \frac{P_T}{E_T} + \frac{P_R}{E_R}} \) = 1.00

### Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>8 ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>8 ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>0.00 ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
</tbody>
</table>

**Calc Speed Adj and FFS**

- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures

#### Operational (LOS)

- \( v_p = \frac{V \times f_HV + DDHV \times f_HV}{PHF \times N \times f_HV} \) pc/h/ln
- \( S = \frac{59.1}{\text{mph}} \)
- \( D = \frac{v_p}{S} \) pc/mi/ln
- **LOS**: D

#### Design (N)

**Design LOS**

- **Design LOS**: pc/h/ln
- **D**: pc/mi/ln

**Required Number of Lanes, N**

### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **D**: Density
- **f_HV**: Free-flow speed
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location

- **E_R**: Exhibits 11-10, 11-12
- **f_LW**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_LC**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Site Information**:
  - **Highway/Direction of Travel**: I-710/Northbound
  - **From/To**: n/o I-105 and n/o Firestone
  - **Jurisdiction**: CALTRANS
  - **Analysis Year**: 2026 Proposed Project
  - **Project Description**: YTI Project - Port of Los Angeles

#### Flow Inputs
- **Volume, V**: 9237 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**:
  - **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_B**: 0
- **General Terrain**: Level

#### Calculate Flow Adjustments
- \( f_p = 1.00 \quad E_R = 1.2 \)
- \( E_T = 1.5 \quad f_{HV} = \frac{1}{E_T} - 1 + P_B \cdot (E_T - 1) \cdot 1.000 \)

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures

#### Design (N)
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \)
  - \( S = 49.2 \text{ mph} \)
  - \( D = v_p / S \)
  - \( LOS = F \)

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **\( v_p \)**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **FFS**: Free-flow speed

#### Factor Location
- **\( E_R \)**: Exhibits 11-10, 11-12
- **\( f_{HV} \)**: Exhibit 11-8
- **\( f_p \)**: Page 11-18
- **\( E_T \)**: Exhibits 11-10, 11-11, 11-13
- **\( f_{LC} \)**: Exhibit 11-9
- **TRD**: Page 11-11
- **LOS, S, FFS, \( v_p \)**: Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: n/o I-105 & n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

### Flow Inputs
- **Volume, V (veh/h)**: 8366
- **AADT (veh/day)**: 2026 Proposed Project
- **Peak-Hr Prop. of AADT, K**
- **Peak-Hr Direction Prop, D**
- **DDHV = AADT x K x D (veh/h)**
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade %**:
- **Length mi**:
- **Up/Down %**:

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

### Speed Inputs
- **Lane Width (ft)**
- **Rt-Side Lat. Clearance (ft)**
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD (ramps/mi)**
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph
- **Calc Speed Adj and FFS**
  - **f_{LV}**: mph
  - **f_{LC}**: mph
  - **TRD Adjustment**: mph
  - **FFS**: 65.0 mph

### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)**: 2225 pc/h/ln
  - **S**: 55.3 mph
  - **D = v_p / S**: 40.2 pc/mi/ln
  - **LOS**: E

### Design (N)
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)**: pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **Required Number of Lanes, N**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **FFS**: Free-flow speed

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_{LV}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
**Analyst** RA  
**Agency or Company** Raju Associates  
**Date Performed** 8/6/2013  
**Analysis Time Period** AM Peak Hour  
**Project Description** YTI Project - Port of Los Angeles

## Site Information
**Highway/Direction of Travel** SR-47 Northbound  
**From/To** at Cdre. Schuyler Heim Bridge  
**Jurisdiction** CALTRANS  
**Analysis Year** 2026 Proposed Project

## Flow Inputs
- **Volume, V**: 2604 veh/h  
- **AADT**: 2604 veh/day  
- **Peak-Hr Prop. of AADT, K**: 0.94  
- **Peak-Hr Direction Prop, D**: 0.94  
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- **f_p**: 1.00  
- **E_T**: 1.5  
- **f_HV = \frac{1}{f_p[1 + P_T(E_T - 1) + P_R(E_R - 1)]}**: 1.00

## Speed Inputs
- **Lane Width**: ft  
- **Total Ramp Density, TRD**: ramps/mi  
- **FFS (measured)**: 55.0 mph

## LOS and Performance Measures
- **Operational (LOS)**  
  - **V_p = \frac{(V \times \text{DDHV})}{(\text{PHF} \times N \times f_H)}**: 923 pc/h/ln  
  - **S**: 55.0 mph  
  - **D = \frac{V_p}{S}**: 16.8 pc/mi/ln  
  - **LOS**: B

## Glossary
- **N** - Number of lanes  
- **V** - Hourly volume  
- **V_p** - Flow rate  
- **LOS** - Level of service  
- **DDHV** - Directional design hour volume

---

**Factor Location**

- **E_R** - Exhibits 11-10, 11-12  
- **f_LW** - Exhibit 11-8  
- **E_T** - Exhibits 11-10, 11-11, 11-13  
- **f_LC** - Exhibit 11-9  
- **f_p** - Page 11-18  
- **TRD** - Page 11-11  
- **LOS, S, FFS, V_p** - Exhibits 11-2, 11-3

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: SR-47 Southbound at Cdre. Schuyler Heim Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

#### Flow Inputs
- **Volume, V**: 3445 veh/h
- **AADT**: 3445 veh/day
- **Peak-Hr Prop. of AADT, K**: 0.94
- **Peak-Hr Direction Prop, D**: 0.94
- **DDHV = AADT x K x D**: 1.5

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**: Design (N)
- **Design (N)**: Design LOS

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

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**General Information**

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
<th>Highway/Direction of Travel</th>
<th>SR-47/Eastbound</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
<td>From/To</td>
<td>at Vincent Thomas Bridge</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
<td>Jurisdiction</td>
<td>CALTRANS</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
<td>Analysis Year</td>
<td>2026 Proposed Project</td>
</tr>
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</table>

**Project Description**

YTI Project - Port of Los Angeles

**Site Information**

- Oper.(LOS)  
- Des.(N)  
- Planning Data

**Flow Inputs**

- Volume, V: 3416 veh/h  
- AADT: 1817 veh/day  
- Peak-Hr Prop. of AADT, K: 0  
- Peak-Hr Direction Prop, D: 0  
- DDHV = AADT x K x D: 1817 veh/h

**Calculate Flow Adjustments**

- \( f_P = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{(1 + P_T(E_T - 1) + P_R(E_R - 1))} \times 1.000 \)

**Speed Inputs**

- Lane Width: 2 ft  
- Rt-Side Lat. Clearance: 2 ft  
- Number of Lanes, N: 2  
- Total Ramp Density, TRD: 55.0 ramps/mi  
- FFS (measured): 55.0 mph  
- Base free-flow Speed, BFFS: mph

**Calc Speed Adj and FFS**

- \( f_{LW} \)
- \( f_{LC} \)
- TRD Adjustment: mph

**LOS and Performance Measures**

- Operational (LOS)

**Design (N)**

- Design LOS

**Glossary**

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- \( v_p \) - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- BFFS - Base free-flow speed
- DDHV - Directional design hour volume

**Factor Location**

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

### Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>AADT</th>
<th>Peak-Hr Prop. of AADT, K</th>
<th>Peak-Hr Direction Prop, D</th>
<th>DDHV = AADT x K x D</th>
</tr>
</thead>
<tbody>
<tr>
<td>3526 veh/h</td>
<td>veh/day</td>
<td>%Trucks and Buses, P_T</td>
<td>%RVs, P_R</td>
<td>Grade %</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments
- \( f_p \) = 1.00
- \( E_T \) = 1.5
- \( E_R \) = 1.2
- \( f_{HV} \) = \( \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \) = 1.00

### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>Rt-Side Lat. Clearance</th>
<th>Number of Lanes, N</th>
<th>Total Ramp Density, TRD</th>
<th>FFS (measured)</th>
<th>Base free-flow Speed, BFFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ft</td>
<td>ft</td>
<td>2</td>
<td>ramps/mi</td>
<td>55.0 mph</td>
<td>mph</td>
</tr>
</tbody>
</table>

### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>f_LW</th>
<th>f_LC</th>
<th>TRD Adjustment</th>
<th>FFS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>55.0 mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p ) = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)}</td>
<td>Design LOS</td>
</tr>
<tr>
<td>1876 pc/h/ln</td>
<td>( v_p ) = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)}</td>
</tr>
<tr>
<td>54.9 mph</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>34.2 pc/mi/ln</td>
<td>mph</td>
</tr>
<tr>
<td>D = \frac{v_p}{S}</td>
<td>D = \frac{v_p}{S}</td>
</tr>
<tr>
<td>LOS</td>
<td>Required Number of Lanes, N</td>
</tr>
</tbody>
</table>

### Glossary

<table>
<thead>
<tr>
<th>N</th>
<th>V</th>
<th>( v_p )</th>
<th>LOS</th>
<th>DDHV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes</td>
<td>Hourly volume</td>
<td>Flow rate</td>
<td>Level of service</td>
<td>Directional design hour volume</td>
</tr>
</tbody>
</table>

### Factor Location

<table>
<thead>
<tr>
<th>( E_R )</th>
<th>( f_LW )</th>
<th>( E_T )</th>
<th>( f_LC )</th>
<th>TRD</th>
<th>FFS, ( v_p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhibits 11-10, 11-12</td>
<td>Exhibit 11-8</td>
<td>Exhibits 11-10, 11-11, 11-13</td>
<td>Exhibit 11-9</td>
<td>Page 11-18</td>
<td>Exhibits 11-2, 11-3</td>
</tr>
</tbody>
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**BASIC FREEWAY SEGMENTS WORKSHEET**

**General Information**
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: AM Peak Hour
- Project Description: YTI Project - Port of Los Angeles

**Site Information**
- Highway/Direction of Travel: SR-91/Eastbound
- From/To: East of Alameda St & Santa Fe
- Jurisdiction: CALTRANS
- Analysis Year: 2026 Proposed Project

**Flow Inputs**
- Volume, V: 8037 veh/h
- AADT: veh/day
- Peak-Hr Prop. of AADT, K: %
- Peak-Hr Direction Prop, D: veh/h
- DDHV = AADT x K x D: veh/h
- %Trucks and Buses, PT: 0.94
- %RVs, PR: 0
- General Terrain: Level

**Calculate Flow Adjustments**
- f_p: 1.00
- E_R: 1.2
- ET: 1.5
- f_HV = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1)) = 1.000

**Speed Inputs**
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 6
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 65.0 mph
- Base free-flow Speed, BFFS: mph

**Calc Speed Adj and FFS**
- Speed Input
- Calc Speed Adj
- FFS

**LOS and Performance Measures**
- Operational (LOS)
- Design (N)

**Glossary**
- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | SR-91/Westbound |
| From/To                     | East of Alameda St & Santa Fe |
| Jurisdiction                | CALTRANS |
| Analysis Year               | 2026 Proposed Project |

## Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>10121 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>907 veh/day</td>
</tr>
<tr>
<td>Peak-Hour Factor, PHF</td>
<td>0.94</td>
</tr>
<tr>
<td>%Trucks and Buses, PT</td>
<td>0</td>
</tr>
<tr>
<td>%RVs, PR</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>1.00</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>1.5</td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ f_{HV} = \frac{1}{f_p[1 + P_T(E_T - 1) + P_R(E_R - 1)]} = 1.000 \]

## Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>6</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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</table>

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
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<tr>
<td>Design (N)</td>
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## Glossary

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
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<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>p</td>
<td>Flow rate</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
</tr>
<tr>
<td>DDHV</td>
<td>Directional design hour volume</td>
</tr>
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</table>

## Factor Location

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E_R</td>
<td>Exhibits 11-10, 11-12</td>
</tr>
<tr>
<td>f_{LV}</td>
<td>Exhibit 11-8</td>
</tr>
<tr>
<td>E_T</td>
<td>Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>f_{LC}</td>
<td>Exhibit 11-9</td>
</tr>
<tr>
<td>p</td>
<td>Page 11-18</td>
</tr>
<tr>
<td>LOS</td>
<td>S, FFS, v_p - Exhibits 11-2, 11-3</td>
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### BASIC FREEWAY SEGMENTS WORKSHEET

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<th>General Information</th>
<th>Site Information</th>
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<tr>
<td>Analyst RA</td>
<td>Highway/Direction of Travel I-110/Northbound</td>
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<tr>
<td>Agency or Company Raju Associates</td>
<td>From/To South of C St</td>
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<tr>
<td>Date Performed 8/6/2013</td>
<td>Jurisdiction CALTRANS</td>
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<tr>
<td>Analysis Time Period PM Peak Hour</td>
<td>Analysis Year 2026 Proposed Project</td>
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<tr>
<td>Project Description YTI Project - Port of Los Angeles</td>
<td>Oper.(LOS)</td>
</tr>
</tbody>
</table>

#### Flow Inputs

| Volume, V | 5241 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT | veh/day | %Trucks and Buses, P_T | 0 |
| Peak-Hr Prop. of AADT, K | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | Grade % Length mi |

#### Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ f_{HV} = \frac{1}{(1+P_T(E_T - 1)) + P_R(E_R - 1)} \]

#### Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

#### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}) \times f_p} ]</td>
<td>[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}) \times f_p} ]</td>
</tr>
<tr>
<td>S</td>
<td>mph</td>
</tr>
<tr>
<td>D</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td></td>
</tr>
</tbody>
</table>

#### Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- \( v_p \) - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- BFFS - Base free-flow speed
- DDHV - Directional design hour volume

#### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<td>Agency or Company</td>
<td>Raju Associates</td>
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<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
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<tr>
<td>Site Information</td>
<td>Highway/Direction of Travel I-110/Southbound</td>
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<td>From/To</td>
<td>South of C St</td>
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<td>Jurisdiction</td>
<td>CALTRANS</td>
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<tr>
<td>Analysis Year</td>
<td>2026 Proposed Project</td>
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</table>

## Project Description

YTI Project - Port of Los Angeles

### Oper.(LOS)

- Oper.(LOS)
- Des.(N)
- Planning Data

## Flow Inputs

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
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<tbody>
<tr>
<td>Volume, V</td>
<td>5156 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

\[
\begin{align*}
E_R & = 1.2 \\
E_T & = 1.5 \\
E_{HV} & = \frac{1}{(1+P_T(E_T-1) + P_R(E_R-1))} 1.000
\end{align*}
\]

## Speed Inputs

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Input</td>
<td>f_{NW}</td>
</tr>
<tr>
<td>Speed Input</td>
<td>f_{LC}</td>
</tr>
<tr>
<td>TRD Adjustment</td>
<td>mph</td>
</tr>
<tr>
<td>FFS</td>
<td>65.0 mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

### Operational (LOS)

\[
\begin{align*}
v_p & = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \\
S & = 65.0 \text{ mph} \\
D & = \frac{v_p}{S} \text{ pc/mi/ln} \\
LOS & \text{ (C)}
\end{align*}
\]

### Design (N)

Design LOS

\[
\begin{align*}
v_p & = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \\
S & \text{ mph} \\
D & = \frac{v_p}{S} \text{ pc/mi/ln} \\
LOS & \text{ Required Number of Lanes, N}
\end{align*}
\]

## Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- v_p - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- BFFS - Base free-flow speed
- DDHV - Directional design hour volume

## Factor Location

- E_R - Exhibits 11-10, 11-12
- f_{NW} - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_{LC} - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles
- **Highway/Direction of Travel:** I-405/Northbound
- **From/To:** at Santa Fe Av
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 Proposed Project

## Site Information

### Flow Inputs
- **Volume, V:** 9934 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:** %
- **Peak-Hr Direction Prop, D:** %
- **DDHV = AADT x K x D:** veh/h
- **Peak-Hour Factor, PHF:** 0.94
- **%Trucks and Buses, P_T:** 0
- **%RVs, P_R:** 0
- **General Terrain:** Level
- **Grade:** %
- **Length:** mi

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_T:** 1.5
- **E_R:** 1.2
- **f_{HV} = 1/(1+P_T(E_T - 1) + P_R(E_R - 1)):** 1.00

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 5
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed:** mph
- **Calc Speed Adj and FFS**
  - **f_{LW}**
  - **f_{LC}**
  - **TRD Adjustment**
  - **FFS**

### LOS and Performance Measures
- **LOS and Performance Measures**
- **Design (N)**
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV})**
  - **S:** mph
  - **D = v_p / S**
  - **LOS:**
  - **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV})**
  - **S:** mph
  - **D = v_p / S**
  - **LOS:**

### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **v_p - Flow rate**
- **FFS - Free-flow speed**
- **LOS - Level of service**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_{LW} - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

### Site Information
- **Highway/Direction of Travel**: I-405/Southbound
- **From/To**: at Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

### Project Description
- **YTI Project - Port of Los Angeles**

### Flow Inputs
- **Volume, V**: 13025 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{(1 + f_p E_T - 1)} + P_T (E_T - 1) \)

### Speed Inputs
- **Lane Width**: ft
- **RT- Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures

### Design (N)
- **Design LOS**
- **Design (N)**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_p**: Page 11-18
- **LOS**: 11-2, 11-3

---

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# BASIC FREEWAY WORKSHEET

## General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** at Alondra Bl
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 Proposed Project

## Flow Inputs
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>9042 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
<tr>
<td>Peak-Hour Factor, PHF</td>
<td>0.94</td>
</tr>
<tr>
<td>%Trucks and Buses, P_T</td>
<td>0</td>
</tr>
<tr>
<td>%RVs, P_R</td>
<td>0</td>
</tr>
<tr>
<td>General Terrain</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
</tr>
<tr>
<td>Up/Down</td>
<td>%</td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1 + 0.94(1.2 - 1)} + 0.94(1.2 - 1) \times 1.000 \)

## Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 5
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

## LOS and Performance Measures
- **Operational (LOS):**
  - \( v_p = \frac{(V \times DDHV) \times f_{HV}}{(PHF \times N \times f_p) \times f_{HV}} \)
  - \( S = \frac{1924}{61.1} \ pc/h/ln 
  - \( D = \frac{v_p}{S} \)
  - \( LOS = D \)

## Calc Speed Adj and FFS
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Adjustment</td>
<td>mph</td>
</tr>
<tr>
<td>FFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

## Design (N)
- **Design LOS:**
  - \( v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV}) \times f_p} \)
  - \( S = \frac{1924}{61.1} \ pc/h/ln 
  - \( D = \frac{v_p}{S} \)
  - \( LOS = D \)

## Glossary

### N - Number of lanes
### V - Hourly volume
### p - Flow rate
### LOS - Level of service
### DDHV - Directional design hour volume

### S - Speed
### D - Density
### FFS - Free-flow speed

### E_R - Exhibits 11-10, 11-12
### E_T - Exhibits 11-10, 11-11, 11-13
### f_p - Page 11-18
### TRD - Page 11-11
### LOS, S, FFS, v_p - Exhibits 11-2, 11-3
**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: at Alondra Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

### Site Information

- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **General Terrain**: Level
- **Grade % Length, Up/Down %**:

### Flow Inputs

- **Volume, V**: 7880 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %RVs, P_R
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments

\[ f_p = 1.00 \quad E_R = 1.2 \]
\[ E_T = 1.5 \quad f_{HV} = \frac{1}{1+(E_T - 1)} + P_R(E_T - 1) \cdot 1.000 \]

### Speed Inputs

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS

- **f_{LW}**: mph
- **f_{LC}**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures

#### Operational (LOS)

\[ v_p = \frac{(V \text{ or } DDHV) \times (PHF \times N \times f_{HV} \times f_p)}{S} \]
\[ D = \frac{v_p}{S} \]

#### Design (N)

\[ v_p = \frac{(V \text{ or } DDHV) \times (PHF \times N \times f_{HV} \times f_p)}{S} \]
\[ D = \frac{v_p}{S} \]

- **Required Number of Lanes, N**

### Glossary

- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

---

**Factor Location**

- **E_R - Exhibits 11-10, 11-12**: f_{LW} - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_{LC} - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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### BASIC FREEWAY WORKSHEET

#### General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: PM Peak Hour
- Project Description: YTI Project - Port of Los Angeles

#### Site Information
- Highway/Direction of Travel: I-710/Northbound
- From/To: Between I-405 & Del Amo
- Jurisdiction: CALTRANS
- Analysis Year: 2026 Proposed Project

#### Flow Inputs
- Volume, V: 8458 veh/h
- AADT: veh/day
- Peak-Hour Factor, PHF: 0.94
- %Trucks and Buses, PT: 0
- %RVs, PR: 0
- General Terrain: Level
- Grade % Length: Up/Down %

#### Calculate Flow Adjustments
- \( f_p \): 1.00
- \( E_R \): 1.2
- \( E_T \): 1.5
- \( f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \)
- \( f_{HV} \): 1.000

#### Speed Inputs
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 4
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 55.0 mph
- Base free-flow Speed, BFFS: mph

#### LOS and Performance Measures
- Design (N)
- Operational (LOS)
- \( v_p = \frac{V \times DDHV}{PHF \times N \times f_{HV} \times f_p} \)
- \( S \): 50.0 mph
- \( D = v_p / S \): pc/mi/ln
- LOS: E

#### Glossary
- N: Number of lanes
- V: Hourly volume
- \( v_p \): Flow rate
- LOS: Level of service
- DDHV: Directional design hour volume

#### Factor Location
- \( E_R \): Exhibits 11-10, 11-12
- \( f_{HV} \): Exhibit 11-8
- \( E_T \): Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \): Exhibit 11-9
- \( f_p \): Page 11-18
- TRD: Page 11-11
- LOS, S, FFS, \( v_p \): Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-710/Southbound |
| From/To | Between I-405 & Del Amo BL |
| Jurisdiction | CALTRANS |
| Analysis Year | 2026 Proposed Project |

## Flow Inputs

| Volume, V | 7126 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P<sub>T</sub> | 0.94 |
| Peak-Hr Direction Prop, D | %RVs, P<sub>R</sub> | 0 |
| DDHV = AADT x K x D | Rate |  |

## Calculate Flow Adjustments

| f<sub>E</sub> | 1.00 |
| E<sub>T</sub> | 1.5 |
| f<sub>HV</sub> = 1 / (1 + P<sub>T</sub>(E<sub>T</sub> - 1) + P<sub>R</sub>(E<sub>E</sub> - 1)) | 1.000 |

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | mph |
| Base free-flow Speed, BFFS | mph |

## LOS and Performance Measures

| Operational (LOSS)<sub>LOSS</sub> | Design (N) |
| v<sub>p</sub> = (V or DDHV) / (PHF x N x f<sub>HV</sub>)<sub>LOSS</sub> | Design LOS |
| S<sub>LOSS</sub> | pc/h/ln |
| D<sub>LOSS</sub> | mph |
| LOS | pc/mi/ln |

## Glossary

<table>
<thead>
<tr>
<th>N - Number of lanes</th>
<th>S - Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>V - Hourly volume</td>
<td>D - Density</td>
</tr>
<tr>
<td>V&lt;sub&gt;p&lt;/sub&gt; - Flow rate</td>
<td>FFS - Free-flow speed</td>
</tr>
<tr>
<td>LOS - Level of service speed</td>
<td>BFFS - Base free-flow speed</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td></td>
</tr>
</tbody>
</table>

## Factor Location

| E<sub>E</sub> - Exhibits 11-10, 11-12 | f<sub>LW</sub> - Exhibit 11-8 |
| E<sub>T</sub> - Exhibits 11-10, 11-11, 11-13 | f<sub>LC</sub> - Exhibit 11-9 |
| f<sub>p</sub> - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, V<sub>p</sub> - Exhibits 11-2, 11-3 | |

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### BASIC FREEWAY WORKSHEET

#### General Information
- **Analyst** RA
- **Agency or Company** Raju Associates
- **Date Performed** 8/6/2013
- **Analysis Time Period** PM Peak Hour
- **Project Description** YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel** I-710/Northbound
- **From/To** Between PCH & Willow St
- **Jurisdiction** CALTRANS
- **Analysis Year** 2026 Proposed Project

### Flow Inputs
- **Volume, V** 6274 veh/h
- **AADT** veh/day
- **Peak-Hr Prop. of AADT, K**
- **Peak-Hr Direction Prop, D**
- **DDHV = AADT x K x D** veh/h

#### Calculate Flow Adjustments
- **f_p** 1.00
- **E_T** 1.5
- **E_R** 1.2
- **f_{HV} = 1/(1+P_T(E_T - 1) + P_R(E_R - 1))** 1.000

### Speed Inputs
- **Lane Width** ft
- **Rt-Side Lat. Clearance** ft
- **Number of Lanes, N** 3
- **Total Ramp Density, TRD** ramps/mi
- **FFS (measured)** 55.0 mph
- **Base free-flow Speed, BFFS** mph

### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

#### Glossary
- **N** - Number of lanes
- **V** - Hourly volume
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume
- **S** - Speed
- **D** - Density
- **LOS** - Level of service
- **BFFS** - Base free-flow speed

#### Factor Location
- **E_R** - Exhibits 11-10, 11-12
- **f_LW** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_LC** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between PCH & Willow St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

#### Site Information
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade**: %
- **Length**: mi
- **Up/Down %**:

#### Flow Inputs
- **Volume, V**: veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **PM Peak Hour**: Analysis Year

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **fHV = 1/(1+P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/ mi
- **FFS (measured)**: mph
- **Base free-flow Speed, BFFS**: mph

#### Calc Speed Adj and FFS
- **f_LW**: mph
- **f_LC**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

#### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

#### Glossary
- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **v_p** - Flow rate
- **FFS** - Free-flow speed
- **LOS** - Level of service
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume
- **E_R** - Exhibits 11-10, 11-12
- **f_LW** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_LC** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3

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## BASIC FREEWAY WORKSHEET

### General Information
- **Analyst:** RA
- **Project Description:** YTI Project - Port of Los Angeles
- **Date Performed:** 8/6/2013
- **Jurisdiction:** CALTRANS

### Site Information
- **Highway/Direction of Travel:** I-710/Northbound
- **From/To:** North of Florence Av
- **Analysis Year:** 2026 Proposed Project

### Operation (LOS)
- **Oper.(LOS):**

### Des.(N)
- **Design (N):**

### Flow Inputs
- **Volume, V:** 7515 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_T:** 1.5
- **E_R:** 1.2

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

### Calc Speed Adj and FFS
- **f_LW (mph):**
- **f_LC (mph):**
- **TRD Adjustment (mph):**
- **FFS:** 65.0 mph

### LOS and Performance Measures
- **LOS:**

### Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **v_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

### Glossary
- **S:** Speed
- **D:** Density
- **BFFS:** Base free-flow speed
- **LOS:** Level of service

### Factor Location
- **E_R - Exhibits:**
- **f_{LW} - Exhibit:**
- **E_T - Exhibits:**
- **f_{LC} - Exhibit:**
- **f_p - Page:**
- **TRD - Page:**
- **LOS, S, FFS, v_p - Exhibits:**

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### Basic Freeway Segments Worksheet

**General Information**
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles
- **Highway/Direction of Travel:** I-710/Southbound
- **From/To:** North of Florence Av
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 Proposed Project

**Site Information**
- **Peak-Hour Factor, PHF:** 0.94
- **% Trucks and Buses, P_T:** 0
- **% RVs, P_R:** 0
- **General Terrain:** Level
- **Grade:** %
- **Length:** _mi
- **Up/Down:** %

**Flow Inputs**
- **Volume, V:** 8734 veh/h
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h

**Calculate Flow Adjustments**
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + 0.94(1.5 - 1)} = 1.000 \)

**Speed Inputs**
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

**LOS and Performance Measures**
- **Operational (LOS):**
  - \( v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \) pc/h/ln
  - \( S = 52.9 \) mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - **LOS:**

**Design (N):**
- **Design LOS:**
  - \( v_p = \frac{(V \times DDHV)}{(PHF \times N \times f_{HV} \times f_p)} \) pc/h/ln
  - \( S = \) mph
  - \( D = \frac{v_p}{S} \) pc/mi/ln
  - **Required Number of Lanes, N**

**Glossary**
- **N:** Number of lanes
- **V:** Hourly volume
- **v_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume
- **S:** Speed
- **D:** Density
- **FFS:** Free-flow speed
- **BFFS:** Base free-flow speed

**Factor Location**
- **E_R:** Exhibits 11-10, 11-12
- **f_{LVW}:** Exhibit 11-8
- **E_T:** Exhibits 11-10, 11-11, 11-13
- **f_{LC}:** Exhibit 11-9
- **f_p:** Page 11-18
- **TRD:** Page 11-11
- **LOS, S, FFS, v_p:** Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

**Analyst:** RA  
**Agency or Company:** Raju Associates  
**Date Performed:** 8/6/2013  
**Analysis Time Period:** PM Peak Hour  
**Project Description:** YTI Project - Port of Los Angeles

### Site Information

**Highway/Direction of Travel:** I-710/Northbound  
**From/To:** n/o I-105 and n/o Firestone  
**Jurisdiction:** CALTRANS  
**Analysis Year:** 2026 Proposed Project

### Flow Inputs

| Volume, V | 8230 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT | veh/day | %Trucks and Buses, P_T | 0 |
| Peak-Hr Prop. of AADT, K | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | veh/h | Grade % Length mi |

### Calculate Flow Adjustments

\[
f_p = 1.00 \quad E_R = 1.2
\]
\[
E_T = 1.5 \quad f_{HV} = \frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)} \cdot 1.00
\]

### Speed Inputs

| Lane Width | ft | Calc Speed Adj and FFS |
| Rt-Side Lat. Clearance | ft | \( f_{LW} \) mph |
| Number of Lanes, N | 4 | \( f_{LC} \) mph |
| Total Ramp Density, TRD | ramps/mi | TRD Adjustment mph |
| FFS (measured) | 65.0 mph | FFS 65.0 mph |
| Base free-flow Speed, BFFS | mph |

### LOS and Performance Measures

| Operational (LOS) | Design (N) |
| Design LOS |
| \( v_p = \frac{(V \text{ or } DDHV) \times (PHF \times N \times f_{HV})}{2189} \) pc/h/ln | \( v_p = \frac{(V \text{ or } DDHV) \times (PHF \times N \times f_{HV})}{2189} \) pc/h/ln |
| S | 56.2 mph |
| D = \( v_p / S \) | 39.0 pc/mi/ln |
| LOS | E |

| Glossary | Factor Location |
| N - Number of lanes | E_R - Exhibits 11-10, 11-12 |
| V - Hourly volume | f_{LW} - Exhibit 11-8 |
| \( v_p \) - Flow rate | E_T - Exhibits 11-10, 11-11, 11-13 |
| LOS - Level of service | f_{LC} - Exhibit 11-9 |
| DDHV - Directional design hour volume | f_p - Page 11-18 |
| BFFS - Base free-flow speed | LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3 |

---

The document includes various calculations and inputs related to freeway segments, including flow adjustments, speed inputs, and performance measures, along with a glossary and factor location table. The data is used for highway design and planning purposes, focusing on specific parameters such as volume, speed, and LOS (Level of Service) to ensure efficient traffic flow.
### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

#### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: n/o I-105 & n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

#### Project Description
- **Project**: YTI Project - Port of Los Angeles

#### Oper.(LOS) □ Des.(N) □ Planning Data

#### Flow Inputs
- **Volume, V**: 9042 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- \[ f_p = 1.00 \]
- \[ E_T = 1.5 \]
- \[ E_R = 1.2 \]
- \[ f_{HV} = \frac{1}{[1+P_T(E_T-1) + P_R(E_R-1)]} \]

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Calc Speed Adj and FFS
- **f_{LW}**: mph
- **f_{LC}**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - \[ v_p = \frac{(V \text{ or } DDHV) \times \text{PHF} \times N \times f_{HV} - 2405}{S} \text{ pc/h/ln} \]
  - \[ S = 50.7 \text{ mph} \]
  - \[ D = \frac{v_p}{S} \text{ pc/mi/ln} \]
- **LOS**: F

#### Design (N)
- **Design LOS**
  - \[ v_p = \frac{(V \text{ or } DDHV) \times \text{PHF} \times N \times f_{HV} - 2405}{S} \text{ pc/h/ln} \]
  - \[ S = 50.7 \text{ mph} \]
  - \[ D = \frac{v_p}{S} \text{ pc/mi/ln} \]

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **f_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

#### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_{LW}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

---

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<td>PM Peak Hour</td>
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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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</table>

## Site Information

| Highway/Direction of Travel | SR-47/Northbound |
| From/To | at Cdre. Schuyler Heim Bridge |
| Jurisdiction | CALTRANS |
| Analysis Year | 2026 Proposed Project |

## Site Information

- Oper.(LOS)
- Des.(N)
- Planning Data

## Flow Inputs

| Volume, V | 2304 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, \( P_T \) |
| Peak-Hr Direction Prop, D | %RVs, \( P_R \) |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

\[
f_p = 1.00, \quad E_R = 1.2, \quad f_{HV} = \frac{1}{f_p(1+E_R(1-P_T)+P_R(E_R-1))} = 1.000
\]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 3 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 55.0 mph |
| Base free-flow Speed, BFFS | mph |

## LOS and Performance Measures

- Design (N)

## Glossary

- \( N \) - Number of lanes
- \( V \) - Hourly volume
- \( v_p \) - Flow rate
- \( LOS \) - Level of service
- \( DDHV \) - Directional design hour volume

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- \( TRD \) - Page 11-11
- \( LOS, S, FFS, v_p \) - Exhibits 11-2, 11-3
# BASIC FREEWAY WORKSHEET

## General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: PM Peak Hour
- Project Description: YTI Project - Port of Los Angeles
- Highway/Direction of Travel: SR-47/Southbound
- From/To: at Cdre. Schuyler Heim Bridge
- Jurisdiction: CALTRANS
- Analysis Year: 2026 Proposed Project

## Site Information
- Oper.(LOS)
- Des.(N)
- Planning Data

## Flow Inputs
- Volume, V: 1945 veh/h
- AADT: veh/day
- Peak-Hour Factor, PHF: 0.94
- %Trucks and Buses, PT: 0
- %RVs, PR: 0
- Peak-Hr Prop. of AADT, K
- Peak-Hr Direction Prop, D
- DDHV = AADT x K x D
- Grade %
- Length mi
- Up/Down %

## Calculate Flow Adjustments
- f_p: 1.00
- E_T: 1.5
- E_R: 1.2
- f_HV = 1/[f_p*(E_T - 1) + P_R*(E_R - 1)] = 1.000

## Speed Inputs
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 3
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 55.0 mph
- Base free-flow Speed, BFFS: mph

## Calc Speed Adj and FFS
- f_LW
- f_LC
- TRD Adjustment: mph
- FFS: 55.0 mph

## LOS and Performance Measures
- Design (N)

## Glossary
- E_R - Exhibits 11-10, 11-12
- f_LW - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_LC - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11

## Factor Location
- LOS, S, FFS, V_p - Exhibits 11-2, 11-3

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: SR-47/Eastbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

### Flow Inputs
- **Volume, V**: 4237 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: 
- **Peak-Hr Direction Prop, D**: 
- **DDHV = AADT x K x D**: veh/h
- **Oper.(LOS)**: 
- **Des.(N)**: 
- **Planning Data**: 

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **E_T** = \(1/(1+P_T(E_L - 1) + P_R(E_R - 1))\)

### Speed Inputs
- **Oper. (LOS)**

### Calc Speed Adj and FFS
- **f_{LW}**: 
- **f_{LC}**: 
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

### LOS and Performance Measures

### Design (N)
- **Design (N)**

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LW}**: Exhibit 11-8
- **f_{LC}**: Exhibit 11-9
- **TRD**: Page 11-11
- **LOS, S, FFS, V_p**: Exhibits 11-2, 11-3
### BASIC FREEWAY WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: SR-47/Westbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

#### Flow Inputs
- **Volume, V**: 3411 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **f_HV = 1/[1+P_T(E_T - 1) + P_B(E_R - 1)]**: 1.00

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV x f_p)**: 1814 pc/h/ln
  - **S**: 55.0 mph
  - **D = v_p / S**: 33.0 pc/mi/ln
  - **LOS**: D

- **Design (N)**
  - **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_HV x f_p)**: pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **Required Number of Lanes, N**

#### Glossary
- **N - Number of lanes**
- **V - Hourly volume**
- **v_p - Flow rate**
- **LOS - Level of service**
- **DDHV - Directional design hour volume**

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- Analyst: RA
- Agency or Company: Raju Associates
- Date Performed: 8/6/2013
- Analysis Time Period: PM Peak Hour
- Project Description: YTI Project - Port of Los Angeles

#### Site Information
- Highway/Direction of Travel: SR-91/Eastbound
- From/To: East of Alameda St & Santa Fe
- Jurisdiction: CALTRANS
- Analysis Year: 2026 Proposed Project

#### Flow Inputs
<table>
<thead>
<tr>
<th>Volume, V</th>
<th>AADT</th>
<th>Peak-Hr Prop. of AADT, K</th>
<th>DDHV = AADT x K x D</th>
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</thead>
<tbody>
<tr>
<td>7271 veh/h</td>
<td>1.00 veh/day</td>
<td>0</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{f_p^2 + E_T + E_R} \)

#### Speed Inputs
- Lane Width: ft
- Rt-Side Lat. Clearance: ft
- Number of Lanes, N: 6
- Total Ramp Density, TRD: ramps/mi
- FFS (measured): 65.0 mph
- Base free-flow Speed, BFFS: mph

#### LOS and Performance Measures
- Design (N)
- Operational (LOS): \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}^2)} \)
- Design LOS: \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}^2)} \)

#### Glossary
- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

#### Factor Location
- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3

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file:///C:/TEMP/f2k62F6.tmp
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: SR-91/Westbound
- **From/To**: East of Alameda St & Santa Fe
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Proposed Project

## Flow Inputs
- **Volume, V**: 9358 veh/h
- **AADT**: 9358 veh/day
- **Peak-Hr Prop. of AADT, K**: 0
- **Peak-Hr Direction Prop, D**: 0
- **DDHV = AADT x K x D**: 0

## Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{(1 + P_T (E_T - 1)) + P_R (E_R - 1)} \times 1.000 \)

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 6
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures
- **Operational (LOS)**
  \( v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV} \times f_p)} \)
  \( S = 64.0 \text{ mph} \)
  \( D = \frac{v_p}{S} \)
  \( C = \) C

## Glossary
- **N - Number of lanes**
- **V - Hourly volume**
- **Vp - Flow rate**
- **LOS - Level of service**
- **DDHV - Directional design hour volume**

## Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LV} - Exhibit 11-8**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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2026 REDUCED PROJECT
(IMPORVE BERTHS 217-220 ONLY)

AM/PM PEAK HOURS
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

## Site Information
- **Highway/Direction of Travel**: I-110/Northbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

## Flow Inputs
- **Volume, V**: 6392 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: Degree
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **fHV = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))**: 1.000

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_p)**
  - **S**: 63.7 mph
  - **D = v_p / S**: 26.7 pc/mi
- **LOS**: D

## Design (N)
- **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_p)**
  - **S**: mph
  - **D = v_p / S**: pc/mi

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

## Factor Location
- **E_R - Exhibits 11-10, 11-12**: f_LW - Exhibit 11-8
- **E_T - Exhibits 11-10, 11-11, 11-13**: f_LC - Exhibit 11-9
- **f_p - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
**BASIC FREEWAY SEGMENTS WORKSHEET**

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<thead>
<tr>
<th>General Information</th>
<th>Site Information</th>
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<tbody>
<tr>
<td>Analyst: RA</td>
<td>Highway/Direction of Travel I-110/Southbound</td>
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<td>Agency or Company: Raju Associates</td>
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<td>Jurisdiction CALTRANS</td>
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<tr>
<th>Oper.(LOS)</th>
<th>Des.(N)</th>
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<th>Flow Inputs</th>
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<td>AADT</td>
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<td>Calculate Flow Adjustments</td>
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<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
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<tr>
<td>Number of Lanes, N</td>
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<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
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<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
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<td></td>
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<td>Operational (LOS)</td>
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<td>$v_p = (V \ or \ DDHV) / (PHF \times \ N \times f_{HV} \times f_p)$</td>
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<tr>
<td>S</td>
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<td>D</td>
<td>18.4 pc/mi</td>
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<tr>
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<td>C</td>
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<thead>
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<th>Factor Location</th>
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<tr>
<td>N - Number of lanes</td>
<td>$E_R$ - Exhibits 11-10, 11-12</td>
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<tr>
<td>V - Hourly volume</td>
<td>$f_{LV}$ - Exhibit 11-8</td>
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<tr>
<td>$v_p$ - Flow rate</td>
<td>$E_T$ - Exhibits 11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>LOS - Level of service</td>
<td>$f_p$ - Page 11-18</td>
</tr>
<tr>
<td>DDHV - Directional design hour volume</td>
<td>TRD - Page 11-11</td>
</tr>
</tbody>
</table>

| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 |

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### General Information

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information

- **Highway/Direction of Travel**: I-405/Northbound
- **From/To**: at Santa Fe Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

### Flow Inputs

- **Volume, V**: 12796 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments

- \( f_p \):
  - \( E_R \):
  - \( f_{HV} = \frac{1}{(1 + P_T(E_T - 1) + P_R(E_R - 1))} \)

### Speed Inputs

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures

- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or DDHV}) \times f_{HV}}{\text{PHF} \times N \times f_{p}} \)
  - \( S \):
  - \( D = \frac{v_p}{S} \)

### Design (N)

- **Design LOS**

### Glossary

- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed
- E_R - Exhibits 11-10, 11-12
- E_T - Exhibits 11-10, 11-11, 11-13
- \( f_p \) - Page 11-18
- \( f_{HV} \) - Exhibit 11-8
- \( f_{LC} \) - Exhibit 11-9
- TRD - Page 11-11

---

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

**Analyst**: RA  
**Agency or Company**: Raju Associates  
**Date Performed**: 8/6/2013  
**Analysis Time Period**: AM Peak Hour

## Site Information

**Highway/Direction of Travel**: I-405/Southbound  
**From/To**: at Santa Fe Av  
**Jurisdiction**: CALTRANS  
**Analysis Year**: 2026 Reduced Project

### Project Description

- **YTI Project - Port of Los Angeles**
  - Oper.(LOS)  
  - Des.(N)  
  - Planning Data

### Flow Inputs

| Volume, V | 8892 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT | veh/day | %Trucks and Buses, P_T | 0 |
| Peak-Hr Prop. of AADT, K | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D | General Terrain: | Level |

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1 + P_T(E_T - 1)} + P_R(E_R - 1) \) = 1.000

### Speed Inputs

- **Lane Width**: ft  
- **Rt-Side Lat. Clearance**: ft  
- **Number of Lanes, N**: 5  
- **Total Ramp Density, TRD**: ramps/mi  
- **FFS (measured)**: 65.0 mph  
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures

#### Operational (LOS)

\[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV}} \times f_p) \]

- **S**: 61.6 mph  
- **D**: 30.7 pc/mi/ln  
- **LOS**: D

#### Design (N)

- **Design LOS**: v_p = \( \frac{v_p}{S} \) \( \frac{S}{D} \) \( \frac{D}{S} \) pc/mi/ln

### Glossary

- **N**: Number of lanes  
- **V**: Hourly volume  
- **V_p**: Flow rate  
- **LOS**: Level of service  
- **DDHV**: Directional design hour volume

### Factor Location

- **E_R**: Exhibits 11-10, 11-12  
- **E_T**: Exhibits 11-10, 11-11, 11-13  
- **f_p**: Page 11-18  
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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## General Information

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<tr>
<th>Analyst</th>
<th>RA</th>
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<td>Agency or Company</td>
<td>Raju Associates</td>
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<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
</tbody>
</table>

### Site Information

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>I-710/Northbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>From/To</td>
<td>at Alondra Bl</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 Reduced Project</td>
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</table>

### Project Description

YTI Project - Port of Los Angeles

**Oper.(LOS)**

<table>
<thead>
<tr>
<th>oper(LOS)</th>
<th>Des.(N)</th>
<th>Planning Data</th>
</tr>
</thead>
</table>

## Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V</th>
<th>8128 veh/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%RVs, P_R</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>General Terrain: Level</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

\[
f_p = 1.00 \quad E_R = 1.2 \quad f_{HV} = \frac{1}{1+P(P_{HV} - 1)} + P_{HV}(1 - E_R) = 1.000
\]

### Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>5</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>f_LW</th>
<th>mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_LC</td>
<td>mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV})</td>
<td>Design LOS</td>
</tr>
<tr>
<td>S = 63.5 mph</td>
<td>v_p = (V or DDHV) / (PHF x N x f_{HV})</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>pc/mi/ln</td>
</tr>
</tbody>
</table>

### Glossary

- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **f_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

### Factor Location

- E_R - Exhibits 11-10, 11-12
- f_{HV} - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_{HV} - Page 11-18
- TRD - Page 11-11

**Required Number of Lanes, N**
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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</table>

## Site Information

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>I-710/Southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>From/To</td>
<td>at Alondra Bl</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 Reduced Project</td>
</tr>
</tbody>
</table>

## Project Description

| YTI Project - Port of Los Angeles |

## Flow Inputs

| Volume, V | 10588 veh/h |
| AADT      | veh/day     |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ E_R = 1.2 \]
\[ f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \]

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## Calc Speed Adj and FFS

| \( f_{LV} \) | mph |
| \( f_{LC} \) | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

## LOS and Performance Measures

| \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p) \) | 2253 pc/h/ln |
| \( S \) | 54.7 mph |
| \( D = v_p / S \) | 41.2 pc/ln |
| LOS | E |

## Design (N)

| Design LOS | \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p) \) | pc/h/ln |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

## Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- \( v_p \) - Flow rate
- FFS - Free-flow speed
- LOS - Level of service
- BFFS - Base free-flow speed
- DDHV - Directional design hour volume

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To                     | Between I-405 & Del Amo BI |
| Jurisdiction                | CALTRANS |
| Analysis Year               | 2026 Reduced Project |

## Oper.(LOS) Des.(N) Planning Data

## Flow Inputs

| Volume, V (veh/h) | 8758 | Peak-Hour Factor, PHF (0.94) |
| AADT (veh/day)    |       | %Trucks and Buses, P_T (0)   |
| Peak-Hr Prop. of AADT, K |       | %RVs, P_R (0)               |
| Peak-Hr Direction Prop, D |   | General Terrain: Level |
| DDHV = AADT x K x D (veh/h) |       | Grade % Length mi |
|                      |       | Up/Down %                   |

## Calculate Flow Adjustments

| f_p (1.00) | E_R (1.2) | \( f_{HV} = \frac{1}{f_p \cdot E_R \cdot \left( E_T - 1 \right) + \frac{P_R}{P_T} \cdot \left( E_T - 1 \right)} \cdot 1.000 |

## Speed Inputs

| Lane Width (ft) |        |
| Rt-Side Lat. Clearance (ft) |        |
| Number of Lanes, N (4) |        |
| Total Ramp Density, TRD (ramps/mi) |        |
| FFS (measured) (55.0 mph) |        |
| Base free-flow Speed, BFFS (mph) |        |

## LOS and Performance Measures

| Operational (LOS) | Design (N) |
| (V or DDHV) / (PHF x N x f_{HV}) x f_p (2329 pc/h/ln) | Design LOS |
| S (48.1 mph) |        |
| D = v_p / S (48.4 pc/mi/ln) |        |
| LOS |        |

## Glossary

| N - Number of lanes | S - Speed | E_R - Exhibits 11-10, 11-12 | f_{LVW} - Exhibit 11-8 |
| V - Hourly volume | D - Density | E_T - Exhibits 11-10, 11-11, 11-13 | f_{LC} - Exhibit 11-9 |
| v_p - Flow rate | FFS - Free-flow speed | f_p - Page 11-18 | TRD - Page 11-11 |
| LOS - Level of service | BFFS - Base free-flow speed | LOS, S, FFS, v_p - Exhibits 11-2, 11-3 |
| DDHV - Directional design hour volume |        |        |        |

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2/5/2014
BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst: RA  
Agency or Company: Raju Associates  
Date Performed: 8/6/2013  
Analysis Time Period: AM Peak Hour  
Project Description: YTI Project - Port of Los Angeles

Site Information

Highway/Direction of Travel: I-710/Southbound  
From/To: Between I-405 & Del Amo  
Jurisdiction: CALTRANS  
Analysis Year: 2026 Reduced Project

Flow Inputs

Volume, V: 9197 veh/h  
AADT: veh/day  
Peak-Hour Factor, PHF: 0.94  
%Trucks and Buses, PT: 0  
%RVs, PR: 0  
Peak-Hr Prop. of AADT, K:  
Peak-Hr Direction Prop, D:  
DDHV = AADT x K x D: veh/h  
Grade: %  
Length: mi

Calculate Flow Adjustments

\( f_p = 1.00 \)  
\( E_T = 1.5 \)

Flow Input Adjusted Flow:

\( f_{HV} = \frac{1}{1 + P_T f_T} \)  
\( E_R = 1.2 \)

Speed Inputs

Lane Width: ft  
Rt-Side Lat. Clearance: ft  
Number of Lanes, N: 4  
Total Ramp Density, TRD: ramps/mi  
FFS (measured): 55.0 mph  
Base free-flow Speed, BFFS: mph

Calc Speed Adj and FFS

\( f_{LW} \)  
\( f_{LC} \)  
TRD Adjustment: mph  
FFS: 55.0 mph

Loss and Performance Measures

Operational (LOS)

\( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{hv})} \)  
\( S = 44.7 \text{ mph} \)  
\( D = v_p / S \)  
\( F = \) LOS

Design (N)

Design LOS.

\( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{hv})} \)  
\( S = \) mph  
\( D = v_p / S \)  
Required Number of Lanes, N

Glossary

N - Number of lanes  
V - Hourly volume  
D - Density  
v_p - Flow rate  
LOS - Level of service  
DDHV - Directional design hour volume

Factor Location

\( E_R - \text{ Exhibits } 11-10, 11-12 \)  
\( f_{LW} - \text{ Exhibit } 11-8 \)  
\( E_T - \text{ Exhibits } 11-10, 11-11, 11-13 \)  
\( f_{LC} - \text{ Exhibit } 11-9 \)  
\( f_p - \text{ Page } 11-18 \)  
LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between PCH & Willow St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

### Flow Inputs
| Volume, V | 7979 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT | veh/day | %Trucks and Buses, \( P_T \) | 0 |
| Peak-Hr Prop. of AADT, \( K \) | 0 %RVs, \( P_R \) | 0 |
| Peak-Hr Direction Prop, \( D \) | General Terrain: Level |
| DDHV = AADT x K x D | veh/h | Grade % | Length mi |

### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} = 1.000 \)

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, \( N \)**: 3
- **Total Ramp Density, \( \text{TRD} \)**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS
<table>
<thead>
<tr>
<th>Speed</th>
<th>Value</th>
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<tbody>
<tr>
<td>( f_{LW} )</td>
<td>( E_R )</td>
</tr>
<tr>
<td>( f_{LC} )</td>
<td>( 1.2 )</td>
</tr>
<tr>
<td>TRD Adjustment</td>
<td>mph</td>
</tr>
<tr>
<td>FFS</td>
<td>55.0 mph</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

#### Operational (LOS)
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} = \frac{2829}{28.9} \text{ pc/h/ln} \)
- \( D = \frac{v_p}{S} = 98.0 \text{ pc/mi/ln} \)

#### Design (N)
- Design LOS
- \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} = \frac{p}{h/ln} \)
- \( D = \frac{v_p}{S} \)
- Required Number of Lanes, \( N \)

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location
- \( E_R \): Exhibits 11-10, 11-12
- \( f_{LW} \): Exhibit 11-8
- \( E_T \): Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \): Exhibit 11-9
- \( f_p \): Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \): Exhibits 11-2, 11-3
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles
- **Jurisdiction:** CALTRANS
- **From/To:** Between PCH & Willow St
- **Highway/Direction of Travel:** I-710/Southbound

### Site Information
- **Analysis Year:** 2026 Reduced Project

### Flow Inputs
- **Volume, V:** 8685 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_T:** 1.5
- **E_R:** 1.2
- **f_HV = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))**
- **1.000**

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 3
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 55.0 mph
- **Base free-flow Speed, BFFS:** mph

### Calc Speed Adj and FFS
- **f_LW:** mph
- **f_LC:** mph
- **TRD Adjustment:** mph
- **FFS:** 55.0 mph

### LOS and Performance Measures
- **Operational (LOS):**
- **LOS:**
- **LOS F:**

### Design (N)
- **Design (N):**

### Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **v_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

### Factor Location
- **E_R:** Exhibits 11-10, 11-12
- **f_LW:** Exhibit 11-8
- **E_T:** Exhibits 11-10, 11-11, 11-13
- **f_LC:** Exhibit 11-9
- **f_p:** Page 11-18
- **TRD:** Page 11-11
- **LOS, S, FFS, v_p:** Exhibits 11-2, 11-3

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### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

### Flow Inputs
- **Volume, V**: 9245 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %Trucks and Buses, P<sub>T</sub> 0
- **Peak-Hr Direction Prop, D**: %RVs, P<sub>R</sub> 0
- **DDHV = AADT x K x D**: veh/h
- **Grade**: %
- **Length**: mi
- **Up/Down %**: 

### Calculate Flow Adjustments
- **f<sub>p</sub>**: 1.00
- **E<sub>R</sub>**: 1.2
- **f<sub>HV</sub> = 1/(1+P<sub>T</sub>(E<sub>R</sub>-1) + P<sub>R</sub>(E<sub>R</sub>-1)) 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS
- **f<sub>LW</sub>**
- **f<sub>LC</sub>**
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures
- **LOS (Operational)**
  - **v<sub>p</sub> = (V or DDHV) / (PHF x N x f<sub>HV</sub>)**: pc/h/ln
  - **S**: 49.1 mph
  - **D = v<sub>p</sub> / S**: pc/mi/ln
- **LOS**: F

### Design (N)
- **Design LOS**
  - **v<sub>p</sub> = (V or DDHV) / (PHF x N x f<sub>HV</sub>)**: pc/h/ln
  - **S**: mph
  - **D = v<sub>p</sub> / S**: pc/mi/ln
  - **Required Number of Lanes, N**: 

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v<sub>p</sub>**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location
- **E<sub>R</sub> - Exhibits 11-10, 11-12**: f<sub>LW</sub> - Exhibit 11-8
- **E<sub>T</sub> - Exhibits 11-10, 11-11, 11-13**: f<sub>LC</sub> - Exhibit 11-9
- **f<sub>p</sub> - Page 11-18**: TRD - Page 11-11
- **LOS, S, FFS, v<sub>p</sub> - Exhibits 11-2, 11-3**
### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: AM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: North of Florence Av
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

### Site Information
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade**: %
- **Length**: mi
- **Up/Down %**: 

### Flow Inputs
- **Volume, V**: 7697 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: 0
- **Peak-Hr Direction Prop, D**: 0
- **DDHV = AADT x K x D**: veh/h

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = \frac{1 + [P_T(E_T - 1)] + P_R(E_R - 1)}{1.00}**: 1.00

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### Speed Adj and FFS
- **f_{LW}**: mph
- **f_{LC}**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

### LOS and Performance Measures
- **LOS**
- **D = \frac{v_p}{S}**
- **D**: pc/mi
- **S**: mph
- **D = \frac{v_p}{S}**
- **S**: mph

### Design (N)
- **Design LOS**
- **Design (N)**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**
- **Required Number of Lanes, N**

### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **v_p - Flow rate**
- **FFS - Free-flow speed**
- **LOS - Level of service**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**
- **E_R - Exhibits 11-10, 11-12**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_{LW} - Exhibit 11-8**
- **f_{LC} - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<td>Raju Associates</td>
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<td>AM Peak Hour</td>
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<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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## Site Information

| Highway/Direction of Travel | I-710/Northbound |
| From/To | n/o I-105 and n/o Firestone |
| Jurisdiction | CALTRANS |
| Analysis Year | 2026 Reduced Project |

## Flow Inputs

| Volume, V | 9237 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | % |
| Peak-Hr Direction Prop, D | Grade |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

| $f_p$ | 1.00 |
| $E_T$ | 1.5 |
| $E_R$ | 1.2 |
| $f_{HV}$ | $\frac{1}{(1 + f_p)E_T - 1} + P_R(E_R - 1)$ |

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## Calc Speed Adj and FFS

| $f_{LW}$ |
| $f_{LC}$ |
| TRD Adjustment |
| FFS |

## LOS and Performance Measures

| Operational (LOS) |
| Design (N) |

| $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV})$ | Design LOS |
| 2457 pc/h/ln |
| 49.2 mph |
| 50.0 pc/mi/ln |
| $F$ |
| Required Number of Lanes, N |

## Glossary

- N - Number of lanes
- V - Hourly volume
- $v_p$ - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

## Factor Location

- $f_{LW}$ - Exhibit 11-8
- $f_{LC}$ - Exhibit 11-9
- TRD - Page 11-11

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# BASIC FREEWAY SEGMENTS WORKSHEET

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<td>YTI Project - Port of Los Angeles</td>
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## Site Information

| Highway/Direction of Travel | I-710/Southbound |
| From/To | n/o I-105 & n/o Firestone |
| Jurisdiction | CALTRANS |
| Analysis Year | 2026 Reduced Project |

## Flow Inputs

| Volume, V | 8366 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | General Terrain: |
| DDHV = AADT x K x D | Grade | % | Length | mi |

## Calculate Flow Adjustments

- f_p = 1.00
- E_T = 1.5
- E_R = 1.2
- \( f_{HV} = \frac{1}{1+(P_T + 1) + P_R(P_R - 1)} \times 1.000 \)

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## Calc Speed Adj and FFS

| f_LW | mph |
| f_TC | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

## LOS and Performance Measures

| Operational (LOS) | Design (N) |
| v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p) | v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p) |
| S | pc/h/ln |
| D | pc/mi/ln |
| LOS | E |

## Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

## Factor Location

| E_R - Exhibits 11-10, 11-12 | f_LW - Exhibit 11-8 |
| E_T - Exhibits 11-10, 11-11, 11-13 | f_TC - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 |
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles
- **Site Information:**
  - **Highway/Direction of Travel:** SR-47 Northbound at Cdre. Schuyler Heim Bridge
  - **Jurisdiction:** CALTRANS

### Site Information
- **Oper.(LOS):**
- **Des.(N):**
- **Planning Data:**

### Flow Inputs
- **Volume, V:** 2604 veh/h
- **AADT:**
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:**

### Calculate Flow Adjustments
- **f_p:** 1.00
- **E_R:** 1.2
- **f_T:** 1.5
- **f_HV = \frac{1}{f_p [E_R (E_T - 1) + P_R (E_R - 1)]}:** 1.000

### Speed Inputs
- **Lane Width:**
- **Rt-Side Lat. Clearance:**
- **Number of Lanes, N:** 3
- **Total Ramp Density, TRD:**
- **FFS (measured):**
- **Base free-flow Speed, BFFS:**

### Calc Speed Adj and FFS
- **f_LW:**
- **f_LC:**
- **TRD Adjustment:**
- **FFS:**

### LOS and Performance Measures
- **Operational (LOS):**
- **Design (N):**

### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **V_p - Flow rate**
- **LOSS - Level of service**
- **DDHV - Directional design hour volume**

---

**Calculation:**

\[
E_R = 1.2 \\
E_T = 1.5 \\
f_HV = \frac{1}{f_p [E_R (E_T - 1) + P_R (E_R - 1)]} = 1.000
\]

**Design LOS:**

\[
v_p = \frac{V}{N} \times f_{pH} \times f_p
\]

**Required Number of Lanes,**

\[
D = \frac{v_p}{S} \\
B = \frac{D}{S}
\]

**Factor Location:**

- **E_R - Exhibits 11-10, 11-12**
- **f_{pH} - Exhibit 11-8**
- **E_T - Exhibits 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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2/5/2014
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** AM Peak Hour

## Site Information
- **Highway/Direction of Travel:** SR-47 Southbound
- **From/To:** at Cdre. Schuyler Heim Bridge
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 Reduced Project

## Project Description
- **Oper.(LOS):** YTI Project - Port of Los Angeles

## Flow Inputs

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<tr>
<th>Parameter</th>
<th>Value</th>
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<td>Volume, V</td>
<td>3445</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/h</td>
</tr>
<tr>
<td>Peak-Hour Factor, PHF</td>
<td>0.94</td>
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<tr>
<td>%Trucks and Buses, P_T</td>
<td>0</td>
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<td>Peak-Hr Prop. of AADT, K</td>
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</tr>
<tr>
<td>%RVs, P_R</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td></td>
</tr>
<tr>
<td>Up/Down %</td>
<td></td>
</tr>
</tbody>
</table>

## Calculation of Flow Adjustments

\[
f_p = 1.00 \quad \quad \quad E_R = 1.2\]

\[
f_{HV} = \frac{1}{(1 + P_t(E_T - 1) + P_R(E_R - 1))} \times 1.000
\]

## Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
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<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
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<tr>
<td>FFS (measured)</td>
<td>55.0 mph</td>
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<tr>
<td>Base free-flow Speed, BFFS</td>
<td>mph</td>
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## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Operational (LOS)</td>
<td></td>
</tr>
<tr>
<td>Design (N)</td>
<td></td>
</tr>
</tbody>
</table>

## Glossary
- **N:** Number of lanes
- **V:** Hourly volume
- **V_p:** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume
- **S:** Speed
- **D:** Density
- **FFS:** Free-flow speed
- **LOS:** Level of service
- **BFFS:** Base free-flow speed

## Factor Location
- **E_R:** Exhibits 11-10, 11-12
- **f_{HV}:** Exhibit 11-8
- **E_T:** Exhibits 11-10, 11-11, 11-13
- **f_LW:** Exhibit 11-9
- **f_p:** Page 11-18
- **LOS:** S, FFS, V_p - Exhibits 11-2, 11-3
- **TRD:** Page 11-11

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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</table>

## Site Information

| Highway/Direction of Travel | SR-47/Eastbound |
| From/To | at Vincent Thomas Bridge |
| Jurisdiction | CALTRANS |
| Analysis Year | 2026 Reduced Project |

## Flow Inputs

| Volume, V | 3416 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5 |
| E_R | 1.2 |
| f_HV = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1)) | 1.000 |

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 2 |
| Total Ramp Density, TRD | ramps/ft |
| FFS (measured) | 55.0 mph |
| Base free-flow Speed, BFFS | mph |

## Calc Speed Adj and FFS

| f_LW | mph |
| f_LC | mph |
| TRD Adjustment | mph |
| FFS | 55.0 mph |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
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<tbody>
<tr>
<td>v_p = (V or DDHV) / (PHF x N x f_hv)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>x f_p</td>
<td>v_p = (V or DDHV) / (PHF x N x f_HV)</td>
</tr>
<tr>
<td>S</td>
<td>pc/h/ln</td>
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<tr>
<td>D = v_p / S</td>
<td>pc/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>D</td>
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</tbody>
</table>

## Glossary

- **N** - Number of lanes
- **V** - Hourly volume
- **f_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

## Factor Location

- **E_R** - Exhibits 11-10, 11-12
- **f_LW** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_LC** - Exhibit 11-9
- **f_p** - Page 11-18
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information

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### Flow Inputs

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<td>veh/day</td>
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### Calculate Flow Adjustments

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### Speed Inputs

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<td>Number of Lanes, N</td>
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<td>ramps/mi</td>
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<td>Directional design hour volume</td>
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<td>Free-flow speed</td>
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<td>BFFS</td>
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</table>

| Project Description | YTI Project - Port of Los Angeles |
| Des.(N) | Planning Data |

### Flow Inputs

| Volume, V | 8037 | veh/h |
| AADT      | veh/day |
| Peak-Hr Prop. of AADT, K | %RNs, P_n |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDH = AADT x K x D | veh/h |
| Grade | % |

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( f_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{f_p [1 + P_U [E_T - 1] + P_R [E_R - 1]]} \times 1.000 \)

### Speed Inputs

| Lane Width   | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 6 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 | mph |
| Base free-flow speed, BFFS | mph |

### LOS and Performance Measures

| Operational (LOS) | Design (N) |
| \( v_p = (V or DDH) / (PHF x N x f_{HV} x f_p) \) | \( v_p = (V or DDH) / (PHF x N x f_{HV} x f_p) \) |
| S                 | 65.0 | mph |
| D = v_p / S       | 21.9 | pc/mi/ln |
| LOS               | C    |

### Glossary

| N - Number of lanes | S - Speed |
| V - Hourly volume   | D - Density |
| \( v_p \) - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDH - Directional design hour volume | |

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | SR-91/Westbound |
| From/To                     | East of Alameda St & Santa Fe |
| Jurisdiction                | CALTRANS |
| Analysis Year               | 2026 Reduced Project |

## Flow Inputs

| Volume, V (veh/h) | 10121 |
| AADT (veh/day)    | 0.94 |
| Peak-Hr Prop. of AADT, K | 0 |
| Peak-Hr Direction Prop. D | 0 |
| DDHV = AADT x K x D (veh/h) | 1.00 |

## Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5  |

## Speed Inputs

| Lane Width (ft) | ft |
| Number of Lanes, N | 6 |
| Total Ramp Density, TRD (ramps/mi) | |
| FFS (measured) (mph) | 65.0 |

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} x f_p) )</td>
<td>( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} x f_p) )</td>
</tr>
<tr>
<td>S (mph)</td>
<td>S (mph)</td>
</tr>
<tr>
<td>D = v_p / S (pc/mi/ln)</td>
<td>D = v_p / S (pc/mi/ln)</td>
</tr>
<tr>
<td>LOS</td>
<td></td>
</tr>
</tbody>
</table>

## Glossary

- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

## Factor Location

- E_R - Exhibits 11-10, 11-12
- f_LW - Exhibit 11-8
- E_T - Exhibits 11-10, 11-11, 11-13
- f_LC - Exhibit 11-9
- f_p - Page 11-18
- TRD - Page 11-11
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour
- **Project Description:** YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel:** I-110/Northbound
- **From/To:** South of C St
- **Jurisdiction:** CALTRANS
- **Analysis Year:** 2026 Reduced Project

### Flow Inputs
- **Volume, V:** 5241 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:** %
- **Peak-Hr Direction Prop, D:** General Terrain:
- **DDHV = AADT x K x D:** veh/h

### Calculate Flow Adjustments
- **\( f_p \):** 1.00
- **\( E_r \):** 1.2
- **\( f_{pHV} = \frac{1}{(1+P_T)(E_r - 1)} \):** 1.000

### Speed Inputs
- **Lane Width:** ft
- **Rt-Side Lat. Clearance:** ft
- **Number of Lanes, N:** 4
- **Total Ramp Density, TRD:** ramps/mi
- **FFS (measured):** 65.0 mph
- **Base free-flow Speed, BFFS:** mph

### Calc Speed Adj and FFS
- **\( f_{LW} \):** mph
- **\( f_{LC} \):** mph
- **TRD Adjustment:** mph
- **FFS:** 65.0 mph

### LOS and Performance Measures

#### Operational (LOS)
- **\( v_p = \frac{V \times \text{DDHV}}{(\text{PHF} \times N \times f_{pHV} \times f_p)} \):** 1394 pc/h/ln
- **S:** 65.0 mph
- **D:** 21.4 pc/mi/ln
- **LOS:** C

#### Design (N)
- **\( v_p = \frac{V \times \text{DDHV}}{(\text{PHF} \times N \times f_{pHV} \times f_p)} \):** pc/h/ln
- **S:** mph
- **D:** pc/mi/ln
- **Required Number of Lanes, N:**

### Glossary
- **N:** Number of lanes
- **S:** Speed
- **V:** Hourly volume
- **D:** Density
- **\( v_p \):** Flow rate
- **LOS:** Level of service
- **DDHV:** Directional design hour volume

### Factor Location
- **\( E_r \):** Exhibits 11-10, 11-12
- **\( f_{LW} \):** Exhibit 11-8
- **\( E_t \):** Exhibits 11-10, 11-11, 11-13
- **\( f_{LC} \):** Exhibit 11-9
- **\( f_p \):** Page 11-18
- **TRD:** Page 11-11
- **LOS:** Exhibits 11-2, 11-3

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Highway/Direction of Travel**: I-110/Southbound
- **From/To**: South of C St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

#### Site Information
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade %**:
- **Length mi**:
- **Up/Down %**:

#### Flow Inputs
- **Volume, V**: 5156 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**:
- **Peak-Hr Direction Prop, D**:
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_{HV} = \frac{1}{(1 + P_T(E_T - 1)) + P_R(E_R - 1)}**: 1.000

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Calc Speed Adj and FFS
- **f_{LW}**: mph
- **f_{LC}**: mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

#### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **f_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

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### BASIC FREEWAY SEGMENTS WORKSHEET

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<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
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</tbody>
</table>

#### Site Information

| Highway/Direction of Travel | I-405/Northbound |
| From/To | at Santa Fe Av |
| Jurisdiction | CALTRANS |
| Analysis Year | 2026 Reduced Project |

#### Flow Inputs

| Volume, V | 9934 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | % |
| Peak-Hr Direction Prop, D | veh/h |

#### Calculate Flow Adjustments

| f_p | 1.00 |
| E_T | 1.5 |
| E_R | 1.2 |
| f_{HV} = \frac{1}{1 + f_p (E_T - 1) + E_R (E_R - 1)} | 1.00 |

#### Speed Inputs

| Lane Width | ft |
| Number of Lanes, N | 5 |
| Total Ramp Density, TRD | ramps/MI |
| FFS (measured) | 65.0 mph |

#### LOS and Performance Measures

| \frac{v_p}{S} | 2114 pc/h/ln |
| S | 57.8 mph |
| D = \frac{v_p}{S} | 36.6 pc/mi/ln |
| LOS | E |

#### Design (N)

| Design LOS | Design (N) |
| Design LOS | Design (N) |

#### Glossary

| N | Number of lanes |
| V | Hourly volume |
| v_p | Flow rate |
| LOS | Level of service |
| DDHV | Directional design hour volume |

#### Factor Location

| E_R - Exhibits 11-10, 11-12 | f_{LV} - Exhibit 11-8 |
| E_T - Exhibits 11-10, 11-11, 11-13 | f_{LC} - Exhibit 11-9 |
| f_p - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, v_p - Exhibits 11-2, 11-3 |
## BASIC FREEWAY SEGMENTS WORKSHEET

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<td>Agency or Company</td>
<td>Raju Associates</td>
<td>Highway/Direction of Travel I-405/Southbound</td>
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<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
<td>From/To</td>
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<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
<td>at Santa Fe Av</td>
</tr>
</tbody>
</table>

### Site Information

| Jurisdiction | CALTRANS | Analysis Year | 2026 Reduced Project |

### Flow Inputs

| Volume, V | 13025 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT      |           | %Trucks and Buses, P_T | 0    |
| Peak-Hr Prop. of AADT, K |            | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D |       | General Terrain: | Level |
| DDHV = AADT x K x D | veh/h | Grade | % |

### Calculate Flow Adjustments

\[ f_p = 1.00 \]
\[ E_T = 1.5 \]
\[ E_R = 1.2 \]
\[ f_{HV} = 1.00 \]

### Speed Inputs

| Lane Width | ft | f_{LV} |
| Rt-Side Lat. Clearance | ft | f_{LC} |
| Number of Lanes, N | 5 | |
| Total Ramp Density, TRD | ramps/mi | |
| FFS (measured) | 65.0 mph | |
| BFFS | mph |

### Calc Speed Adj and FFS

| f_{LV} |
| f_{LC} |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

### LOS and Performance Measures

| Operational (LOS) | Design (N) |
| v_p = (V or DDHV) / (PHF x N x f_p) x f_{HV} | v_p = (V or DDHV) / (PHF x N x f_{HV}) x f_p |
| S | pc/h/ln |
| D | pc/mi/ln |
| LOS | |
| F | |

### Glossary

- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- f_p - Page 11-18
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
### General Information

- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information

- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: at Alondra Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

### Flow Inputs

- **Volume, V**: 9042 veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **AADT**: veh/day
- **%Trucks and Buses, P_T**: 0
- **Peak-Hr Prop. of AADT, K**: %RVs, P_R
- **Peak-Hr Direction Prop, D**: General Terrain: Level
- **DDHV = AADT x K x D**: veh/h
- **Grade %**:
- **Length mi**:
- **Up/Down %**:

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1 + 0.94(1.2 - 1)}{1 + 0.94(1.2 - 1)} = 1.00 \)

### Speed Inputs

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures

- **Operational (LOS)**
- **Design (N)**

### Glossary

- **N**: Number of lanes
- **V**: Hourly volume
- **V_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Factor Location

- **E_R**: Exhibits 11-10, 11-12
- **E_p**: Page 11-18
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: at Alondra Bl
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

#### Flow Inputs
- **Volume, V**: 7880 veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %Trucks and Buses, P_T
- **Peak-Hr Direction Prop, D**: %RVs, P_R
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1+P_T(E_T - 1) + P_R(E_R - 1)} \)

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 5
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Calc Speed Adj and FFS
- \( f_{LW} \) mph
- \( f_{LC} \) mph
- **TRD Adjustment**: mph
- **FFS**: 65.0 mph

#### LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

#### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume
- **S**: Speed
- **D**: Density
- **BFFS**: Base free-flow speed
- **LOSS, S, FFS, v_p**: Exhibits 11-2, 11-3
- **E_R**: Exhibits 11-10, 11-12
- **f_{LW}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles
- **Site Information**: Highway/Direction of Travel I-710/Northbound
- **From/To**: Between I-405 & Del Amo BI
- **Jurisdiction**: CALTRANS
- **Planning Year**: 2026 Reduced Project

### Site Information
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, PT**: 0
- **%RVs, PR**: 0
- **General Terrain**: Level
- **Terrain**: Up/Down %

### Flow Inputs
- **Volume, V**: 8458 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Flow Inputs**: %

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **f_HV = 1/[1 + P_H(V - 1) + P_R(E_R - 1)]**: 1.000

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### LOS and Performance Measures
- **Operational (LOS)**
  - **V_p = (V or DDHV) / (PHF x N x f_hv)**
  - **x f_p)**
  - **S**: 50.0 mph
  - **D = V_p / S**: 45.0 pc/mi/ln
  - **LOS**: E

### Design (N)
- **Design (N)**
  - **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_hv)**
  - **x f_p)**
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **Required Number of Lanes, N**

### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **V_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

### Factor Location
- **E_R - Exhibits 11-10, 11-12**
- **f_LW - Exhibit 11-8**
- **E_T - Exhibits 11-10, 11-11, 11-13**
- **f_LC - Exhibit 11-9**
- **f_p - Page 11-18**
- **TRD - Page 11-11**
- **LOS, S, FFS, v_p - Exhibits 11-2, 11-3**

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### BASIC FREEWAY SEGMENTS WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: Between I-405 & Del Amo BL
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

#### Flow Inputs
- **Volume, V**: 7126 veh/h
- **AADT**: veh/day
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **Peak-Hr Prop. of AADT, K**: veh/day
- **Peak-Hr Direction Prop, D**: veh/h
- **DDHV = AADT x K x D**: veh/h

#### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_HV = 1/[(1 + P_T(E_T - 1) + P_R(E_R - 1))]**

#### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

#### Speed Inputs
- **Calc Speed Adj and FFS**
  - **f_LW**: mph
  - **f_LC**: mph
  - **TRD Adjustment**: mph
  - **FFS**: 55.0 mph

#### LOS and Performance Measures
- **Operational (LOS)**
  - **v_p = (V or DDHV) / (PHF x N x f_HV) x f_p**: pc/h/ln
  - **S**: 54.8 mph
  - **D = v_p / S**: pc/mi/ln
  - **LOS**: D

#### Design (N)
- **Design (N)**
  - **Design LOS**
  - **v_p = (V or DDHV) / (PHF x N x f_HV) x f_p**: pc/h/ln
  - **S**: mph
  - **D = v_p / S**: pc/mi/ln
  - **Required Number of Lanes, N**: Required Number of Lanes

#### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **v_p - Flow rate**
- **FFS - Free-flow speed**
- **LOS - Level of service**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**

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## BASIC FREEWAY SEGMENTS WORKSHEET

### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

### Site Information
- **Highway/Direction of Travel**: I-710/Northbound
- **From/To**: Between PCH & Willow St
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

### Oper.(LOS)
- **Blank**: oper.
- **Des.(N)**:
- **Planning Data**:

### Flow Inputs
| Volume, V | 6274 veh/h | Peak-Hour Factor, PHF | 0.94 |
| AADT | veh/day | %Trucks and Buses, P_T | 0 |
| Peak-Hr Prop. of AADT, K | %RVs, P_R | 0 |
| Peak-Hr Direction Prop, D | General Terrain: Level |
| DDHV = AADT x K x D | veh/h | Grade % | Length mi |

### Calculate Flow Adjustments
- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- \[ f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)} \times 1.00 \]

### Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

### Calc Speed Adj and FFS
- **f_{LW}**: mph
- **f_{LC}**: mph
- **TRD Adjustment**: mph
- **FFS**: 55.0 mph

### LOS and Performance Measures

#### Operational (LOS)
- **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)**
- **S**: 50.5 mph
- **D = v_p / S**: 44.0 pc/mi/ln

#### Design (N)
- **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)**
- **S**: mph
- **D = v_p / S**: pc/mi/ln

- **LOS**: E
- **Design LOS**

#### Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **LOS**: Level of service
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume

### Factor Location
- **E_R**: Exhibits 11-10, 11-12
- **f_{LW}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<tr>
<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
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### Site Information

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>I-710/Southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>From/To</td>
<td>Between PCH &amp; Willow St</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 Reduced Project</td>
</tr>
</tbody>
</table>

## Project Description

YTI Project - Port of Los Angeles

## Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V (veh/h)</th>
<th>6323</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT (veh/day)</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_T = \frac{1}{5} \)
- \( f_{HV} = \frac{1}{5} \)

## Speed Inputs

### Calc Speed Adj and FFS

- Speed Width (ft)
- Right Side Lane Clearance (ft)
- Number of Lanes, N (3)
- Total Ramp Density, TRD (ramps/mi)
- FFS (measured) (55.0 mph)
- Base free-flow Speed, BFFS (mph)

## LOS and Performance Measures

### Design (N)

- Operational (LOS)
- Design LOS

## Glossary

- N - Number of lanes
- V - Hourly volume
- \( v_p \) - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LVW} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

**Analyst**  
RA  

**Agency or Company**  
Raju Associates  

**Date Performed**  
8/6/2013  

**Analysis Time Period**  
PM Peak Hour  

**Project Description**  
YTI Project - Port of Los Angeles

## Site Information

- **Highway/Direction of Travel**  
  I-710/Northbound  
- **From/To**  
  North of Florence Av  
- **Jurisdiction**  
  CALTRANS  
- **Analysis Year**  
  2026 Reduced Project

## Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>7515 veh/h</td>
</tr>
<tr>
<td>AADT</td>
<td>veh/day</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td>%</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td>%</td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td>veh/h</td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1 + E_T (E_R - 1) + P_T (E_R - 1)} \cdot 1.000 \)

## Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>ft</td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td>ft</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>4</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td>ramps/mi</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0 mph</td>
</tr>
<tr>
<td>BFFS</td>
<td>mph</td>
</tr>
</tbody>
</table>

## Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f_{LW} )</td>
<td></td>
</tr>
<tr>
<td>( f_{LC} )</td>
<td></td>
</tr>
<tr>
<td>TRD Adjustment</td>
<td>mph</td>
</tr>
<tr>
<td>FFS</td>
<td>65.0 mph</td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p) )</td>
<td>pc/h/ln</td>
</tr>
<tr>
<td>S</td>
<td>59.9 mph</td>
</tr>
<tr>
<td>D = ( v_p / S )</td>
<td>33.4 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td></td>
</tr>
</tbody>
</table>

## Design (N)

- **Design LOS**
- **Required Number of Lanes, N**

## Glossary

- N - Number of lanes  
- S - Speed  
- V - Hourly volume  
- D - Density  
- \( v_p \) - Flow rate  
- FFS - Free-flow speed  
- BFFS - Base free-flow speed  
- DDHV - Directional design hour volume

## Factor Location

- \( E_R \) - Exhibits 11-10, 11-12  
- \( f_{LW} \) - Exhibit 11-8  
- \( E_T \) - Exhibits 11-10, 11-11, 11-13  
- \( f_{LC} \) - Exhibit 11-9  
- \( f_p \) - Page 11-18  
- TRD - Page 11-11  
- LOS, S, FFS, \( v_p \) - Exhibits 11-2, 11-3
# BASIC FREEWAY WORKSHEET

## General Information

<table>
<thead>
<tr>
<th>Analyst</th>
<th>RA</th>
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<tbody>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
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## Site Information

<table>
<thead>
<tr>
<th>Highway/Direction of Travel</th>
<th>I-710/Southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>From/To</td>
<td>North of Florence Av</td>
</tr>
</tbody>
</table>

## Project Description

YTI Project - Port of Los Angeles

- Oper.(LOS)
- Des.(N)
- Planning Data

## Flow Inputs

| Volume, V | 8734 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | %Trucks and Buses, P_T |
| Peak-Hr Direction Prop, D | %RVs, P_R |
| DDHV = AADT x K x D | veh/h |

## Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( E_R = 1.2 \)
- \( f_{HV} = \frac{1}{1 + P_T (E_T - 1)} + P_R (E_R - 1) \times 1.000 \)

## Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |
| Base free-flow Speed, BFFS | mph |

## Calc Speed Adj and FFS

| f_LW | mph |
| f_LC | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

## LOS and Performance Measures

### Operational (LOS)

\[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \]

\[ S = 52.9 \text{ mph} \]

\[ D = \frac{v_p}{S} \]

\[ LOS = E \]

### Design (N)

Design LOS

\[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV})} \times f_p \]

\[ S = \text{ mph} \]

\[ D = \frac{v_p}{S} \]

### Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume

### Factor Location

- \( E_R \) - Exhibits 11-10, 11-12
- \( f_{LV} \) - Exhibit 11-8
- \( E_T \) - Exhibits 11-10, 11-11, 11-13
- \( f_{LC} \) - Exhibit 11-9
- \( f_p \) - Page 11-18
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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2/5/2014
### General Information

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<td>Raju Associates</td>
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<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
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### Site Information

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<th>Site Information</th>
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<tr>
<td>Highway/Direction of Travel</td>
<td>I-710/Northbound</td>
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<tr>
<td>From/To</td>
<td>n/o I-105 and n/o Firestone</td>
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<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
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<td>Analysis Year</td>
<td>2026 Reduced Project</td>
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</table>

### Project Description

| Project Description | YTI Project - Port of Los Angeles |

### Flow Inputs

| Volume, V | 8230 veh/h |
| AADT | veh/day |
| Peak-Hr Prop. of AADT, K | % |
| Peak-Hr Direction Prop, D | % |
| DDHV = AADT x K x D | veh/h |

### Calculate Flow Adjustments

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$f_p$</td>
<td>1.00</td>
</tr>
<tr>
<td>$E_r$</td>
<td>1.2</td>
</tr>
<tr>
<td>$E_T$</td>
<td>1.5</td>
</tr>
</tbody>
</table>

### Speed Inputs

| Lane Width | ft |
| Rt-Side Lat. Clearance | ft |
| Number of Lanes, N | 4 |
| Total Ramp Density, TRD | ramps/mi |
| FFS (measured) | 65.0 mph |

### Calc Speed Adj and FFS

| f_LW | mph |
| f_LC | mph |
| TRD Adjustment | mph |
| FFS | 65.0 mph |

### LOS and Performance Measures

| Operational (LOS) |  |
| Design (N) |  |

#### Operational (LOS)

| $v_p = (V or DDHV) / (PHF x N x f_{HV})$ | 2189 pc/h/ln |
| $S$ | 56.2 mph |
| $D = v_p / S$ | 39.0 pc/mi/ln |
| LOS | E |

#### Design (N)

| Design LOS |  |
| Design (N) |  |

| $v_p = (V or DDHV) / (PHF x N x f_{HV})$ | pc/h/ln |
| $S$ | mph |
| $D = v_p / S$ | pc/mi/ln |

### Glossary

| N | Number of lanes |
| V | Hourly volume |
| $v_p$ | Flow rate |
| LOS | Level of service |
| DDHV | Directional design hour volume |

### Factor Location

| $E_r$ - Exhibits 11-10, 11-12 | 11-8 |
| $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 |
# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information
- **Analyzer**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour

## Site Information
- **Highway/Direction of Travel**: I-710/Southbound
- **From/To**: n/o I-105 & n/o Firestone
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

## Project Description
- **Project**: YTI Project - Port of Los Angeles

## Flow Inputs
- **Volume, V**: 9042 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**:\
- **Peak-Hr Direction Prop, D**:\
- **DDHV = AADT x K x D**: veh/h

## Calculate Flow Adjustments
- **f_p = 1.00**
- **E_R = 1.2**
- **E_T = 1.5**
- **f_HV = 1^{1+P_T(E_T - 1) + P_R(E_R - 1)} = 1.000**

## Speed Inputs
- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 4
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 65.0 mph
- **Base free-flow Speed, BFFS**: mph

## LOS and Performance Measures
- **Operational (LOS)**
- **Design (N)**

## Glossary
- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

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<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

## Site Information

| Highway/Direction of Travel | SR-47/Northbound                         |
| From/To                     | at Cdre. Schuyler Heim Bridge            |
| Jurisdiction                | CALTRANS                                |
| Analysis Year               | 2026 Reduced Project                    |

## Flow Inputs

<table>
<thead>
<tr>
<th>Volume, V (veh/h)</th>
<th>2304</th>
<th>Peak-Hour Factor, PHF</th>
<th>0.94</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT (veh/day)</td>
<td></td>
<td>%Trucks and Buses, P_T</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
<td>%RVs, P_R</td>
<td>0</td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
<td>General Terrain: Level</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D (veh/h)</td>
<td></td>
<td>Grade % Length mi</td>
<td></td>
</tr>
</tbody>
</table>

## Calculate Flow Adjustments

\[
f_p = 1.00 \quad E_R = 1.2
\]

\[
E_T = 1.5 \quad f_{HV} = \frac{1}{f_p[1+P_T(E_T-1) + P_R(E_R-1)]} = 1.000
\]

## Speed Inputs

<table>
<thead>
<tr>
<th>Lane Width (ft)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt-Side Lat. Clearance (ft)</td>
<td></td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>Total Ramp Density, TRD (ramps/mi)</td>
<td></td>
</tr>
<tr>
<td>FFS (measured) (mph)</td>
<td>55.0</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS (mph)</td>
<td></td>
</tr>
</tbody>
</table>

## LOS and Performance Measures

<table>
<thead>
<tr>
<th>Operational (LOS)</th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_{HV} \times f_p)} ] (817 pc/h/ln)</td>
<td>Design LOS</td>
</tr>
<tr>
<td>S (mph)</td>
<td>55.0</td>
</tr>
<tr>
<td>D = \frac{v_p}{S} (pc/mi/ln)</td>
<td>14.9</td>
</tr>
<tr>
<td>LOS (B)</td>
<td></td>
</tr>
</tbody>
</table>

## Glossary

- N - Number of lanes
- S - Speed
- V - Hourly volume
- D - Density
- \(v_p\) - Flow rate
- FFS - Free-flow speed
- BFFS - Base free-flow speed
- LOS - Level of service
- DDHV - Directional design hour volume

## Factor Location

- \(E_R\) - Exhibits 11-10, 11-12
- \(f_{LV}\) - Exhibit 11-8
- \(E_T\) - Exhibits 11-10, 11-11, 11-13
- \(f_{LC}\) - Exhibit 11-9
- \(f_p\) - Page 11-18
- TrD - Page 11-11
- LOS, S, FFS, \(v_p\) - Exhibits 11-2, 11-3

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**BASIC FREEWAY SEGMENTS WORKSHEET**

<table>
<thead>
<tr>
<th>General Information</th>
<th>Site Information</th>
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<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
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<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Project Description</td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
<tr>
<td>Site Information</td>
<td>SR-47/Southbound</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>From/To</td>
<td>at Cdre. Schuyler Heim Bridge</td>
</tr>
</tbody>
</table>

**Flow Inputs**

- **Volume, V**: 1945 veh/h
- **AADT**: 1945 veh/day
- **Peak-Hr Prop. of AADT, K**: 0.94
- **Peak-Hr Direction Prop, D**: 0.94
- **DDHV = AADT x K x D**: veh/h

**Calculate Flow Adjustments**

- **f_p**: 1.00
- **E_T**: 1.5
- **E_R**: 1.2
- **f_{HV} = \frac{1}{f_p(1 + E_T) + P_R(1 - E_R)}**: 1.00

**Speed Inputs**

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 3
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

**LOS and Performance Measures**

- **Operational (LOS)**
  - \(v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{hv} \times f_p)}\)
  - \(S = \frac{690}{55.0}\) pc/h/ln
  - \(D = \frac{v_p}{S}\)
  - \(LOS = B\)

- **Design (N)**
  - **Design LOS**
  - \(v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{hv} \times f_p)}\)
  - \(S = \frac{690}{55.0}\) pc/h/ln
  - \(D = \frac{v_p}{S}\)
  - \(LOS = B\)

**Glossary**

- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **FFS**: Free-flow speed
- **BFFS**: Base free-flow speed
- **DDHV**: Directional design hour volume
- **LOS**: Level of service

**Factor Location**

- **E_R**: Exhibits 11-10, 11-12
- **f_{LVW}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **LOS**: Page 11-18
- **S**: Page 11-11
- **FFS**: Page 11-11
- **v_p**: Exhibits 11-2, 11-3
### BASIC FREEWAY WORKSHEET

#### General Information
- **Analyst**: RA
- **Agency or Company**: Raju Associates
- **Date Performed**: 8/6/2013
- **Analysis Time Period**: PM Peak Hour
- **Project Description**: YTI Project - Port of Los Angeles

#### Site Information
- **Highway/Direction of Travel**: SR-47/Eastbound
- **From/To**: at Vincent Thomas Bridge
- **Jurisdiction**: CALTRANS
- **Analysis Year**: 2026 Reduced Project

#### Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>4237 veh/h</td>
</tr>
<tr>
<td>Peak-Hour Factor, PHF</td>
<td>0.94</td>
</tr>
<tr>
<td>AADT</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D</td>
<td></td>
</tr>
</tbody>
</table>

#### Calculate Flow Adjustments

- \( f_p = 1.00 \)
- \( E_T = 1.5 \)
- \( f_{HV} = \frac{1}{1 + P_T (E_T - 1) + P_R (E_R - 1)} \times 1.000 \)

#### Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td></td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td></td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>2</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td></td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>55.0</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td></td>
</tr>
</tbody>
</table>

#### Calc Speed Adj and FFS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Adjustment</td>
<td></td>
</tr>
<tr>
<td>Forward Speed Adjustment</td>
<td></td>
</tr>
<tr>
<td>TRD Adjustment</td>
<td></td>
</tr>
<tr>
<td>FFS</td>
<td>55.0</td>
</tr>
</tbody>
</table>

#### LOS and Performance Measures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td></td>
</tr>
<tr>
<td>Design (N)</td>
<td></td>
</tr>
</tbody>
</table>

#### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Number of lanes</td>
</tr>
<tr>
<td>V</td>
<td>Hourly volume</td>
</tr>
<tr>
<td>( v_p )</td>
<td>Flow rate</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
</tr>
<tr>
<td>DDHV</td>
<td>Directional design hour volume</td>
</tr>
</tbody>
</table>

#### Factor Location

<table>
<thead>
<tr>
<th>Design</th>
<th>Exhibit (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( E_R )</td>
<td>11-10, 11-12</td>
</tr>
<tr>
<td>( f_{HW} )</td>
<td>Exhibit 11-8</td>
</tr>
<tr>
<td>( E_T )</td>
<td>11-10, 11-11, 11-13</td>
</tr>
<tr>
<td>( f_{LC} )</td>
<td>Exhibit 11-9</td>
</tr>
<tr>
<td>( f_p )</td>
<td>Page 11-18</td>
</tr>
<tr>
<td>LOS, S, FFS, ( v_p )</td>
<td>Exhibits 11-2, 11-3</td>
</tr>
</tbody>
</table>
**BASIC FREEWAY SEGMENTS WORKSHEET**

<table>
<thead>
<tr>
<th>General Information</th>
<th>Site Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst</td>
<td>RA</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>Raju Associates</td>
</tr>
<tr>
<td>Date Performed</td>
<td>8/6/2013</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Highway/Direction of Travel</td>
<td>SR-47/Westbound</td>
</tr>
<tr>
<td>From/To</td>
<td>at Vincent Thomas Bridge</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>CALTRANS</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2026 Reduced Project</td>
</tr>
</tbody>
</table>

Project Description: YTI Project - Port of Los Angeles

Flow Inputs:

- **Volume, V**: 3411 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: %
- **DDHV = AADT x K x D**: veh/h
- **Peak-Hour Factor, PHF**: 0.94
- **%Trucks and Buses, P_T**: 0
- **%RVs, P_R**: 0
- **General Terrain**: Level
- **Grade %**: Up/Down %

Calculate Flow Adjustments:

- **f_p**: 1.00
- **E_R**: 1.2
- **E_T**: 1.5
- **f_{HV} = 1/[(1+P_T(E_T - 1) + P_R(E_R - 1)]**: 1.000

Speed Inputs:

- **Lane Width**: ft
- **Rt-Side Lat. Clearance**: ft
- **Number of Lanes, N**: 2
- **Total Ramp Density, TRD**: ramps/mi
- **FFS (measured)**: 55.0 mph
- **Base free-flow Speed, BFFS**: mph

Calc Speed Adj and FFS:

- **f_{LW}**: mph
- **f_{LC}**: mph

LOS and Performance Measures:

- **Operational (LOS)**
- **Design (N)**

Glossary:

- **N**: Number of lanes
- **S**: Speed
- **V**: Hourly volume
- **D**: Density
- **v_p**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

Factor Location:

- **E_R**: Exhibits 11-10, 11-12
- **f_{LW}**: Exhibit 11-8
- **E_T**: Exhibits 11-10, 11-11, 11-13
- **f_{LC}**: Exhibit 11-9
- **f_p**: Page 11-18
- **TRD**: Page 11-11
- **LOS, S, FFS, v_p**: Exhibits 11-2, 11-3
### General Information

- **Analyist:** RA
- **Agency or Company:** Raju Associates
- **Date Performed:** 8/6/2013
- **Analysis Time Period:** PM Peak Hour

### Site Information

- **Highway/Direction of Travel:** SR-91/Eastbound
- **From/To:** East of Alameda St & Santa Fe
- **Jurisdiction:** CALTRANS

### Project Description

YTI Project - Port of Los Angeles

### Oper.(LOS) Des.(N) Planning Data

### Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V, Vh</td>
<td>7271</td>
</tr>
<tr>
<td>AADT, Vh/day</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Prop. of AADT, K</td>
<td></td>
</tr>
<tr>
<td>Peak-Hr Direction Prop, D</td>
<td></td>
</tr>
<tr>
<td>DDHV = AADT x K x D, Vh/h</td>
<td></td>
</tr>
</tbody>
</table>

### Calculate Flow Adjustments

- **f_p**
- **E_T**
- **f_HV** = \( \frac{1}{E_T} \) 1.2

### Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
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</tr>
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<tbody>
<tr>
<td>Lane Width</td>
<td></td>
</tr>
<tr>
<td>Rt-Side Lat. Clearance</td>
<td></td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>6</td>
</tr>
<tr>
<td>Total Ramp Density, TRD</td>
<td></td>
</tr>
<tr>
<td>FFS (measured)</td>
<td>65.0</td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td></td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

- **Operational (LOS)**
- **Design (N)**

### Glossary

- **N** - Number of lanes
- **V** - Hourly volume
- **V_p** - Flow rate
- **LOS** - Level of service
- **DDHV** - Directional design hour volume

### Factor Location

- **E_R** - Exhibits 11-10, 11-12
- **f_{LC}** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11

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HCS 2010™ Version 6.50 Generated: 2/5/2014 4:01 PM
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<table>
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<th><strong>Analyst</strong></th>
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<td>PM Peak Hour</td>
</tr>
<tr>
<td><strong>Project Description</strong></td>
<td>YTI Project - Port of Los Angeles</td>
</tr>
</tbody>
</table>

### Site Information

| **Highway/Direction of Travel** | SR-91/Westbound |
| **From/To** | East of Alameda St & Santa Fe |
| **Jurisdiction** | CALTRANS |
| **Analysis Year** | 2026 Reduced Project |

### Flow Inputs

| **Volume, V** | 9358 veh/h |
| **AADT** | 9358 veh/day |
| **Peak-Hr Prop. of AADT, K** | 0.94 |
| **Peak-Hr Direction Prop, D** | 0 |
| **DDHV = AADT x K x D** | 0 |

### Calculate Flow Adjustments

| **f_p** | 1.00 |
| **E_R** | 1.2 |
| **E_T** | 1.5 |

### Speed Inputs

| **Lane Width** | ft |
| **Rt-Side Lat. Clearance** | ft |
| **Number of Lanes, N** | 6 |
| **Total Ramp Density, TRD** | ramps/mi |
| **FFS (measured)** | 65.0 mph |
| **Base free-flow Speed, BFFS** | mph |

### LOS and Performance Measures

<table>
<thead>
<tr>
<th><strong>Operational (LOS)</strong></th>
<th>Design (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p) )</td>
<td>Design LOS</td>
</tr>
<tr>
<td>S</td>
<td>mph</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>C</td>
</tr>
</tbody>
</table>

### Glossary

- **N** - Number of lanes
- **S** - Speed
- **V** - Hourly volume
- **D** - Density
- **v_p** - Flow rate
- **FFS** - Free-flow speed
- **BFFS** - Base free-flow speed
- **DDHV** - Directional design hour volume

### Factor Location

- **E_R** - Exhibits 11-10, 11-12
- **f_LW** - Exhibit 11-8
- **E_T** - Exhibits 11-10, 11-11, 11-13
- **f_LC** - Exhibit 11-9
- **f_p** - Page 11-18
- **TRD** - Page 11-11
- **LOS, S, FFS, v_p** - Exhibits 11-2, 11-3