2032 Build - Preferred Alternative with Service Road
# Basic Freeway Segments Worksheet

### General Information
- **Analyst**: KNM  
- **Agency or Company**: HNTB  
- **Date Performed**: 3/25/2008  
- **Project Description**: Wekiva Parkway PD&E  
- **Flow Inputs**:  
  - **Volume, V**: 6470 veh/h  
  - **AADT**: veh/day  
  - **Peak-Hr Prop. of AADT, K**:  
  - **Peak-Hr Direction Prop, D**:  
  - **Driver type adjustment**: 1.00  
- **Calculate Flow Adjustments**:  
  - **f_p**: 1.00  
  - **E_T**: 1.5  
- **Speed Inputs**:  
  - **Lane Width**: 12.0 ft  
  - **Rt-Shoulder Lat. Clearance**: 6.0 ft  
  - **Interchange Density**: 0.45 l/mi  
  - **Number of Lanes, N**: 3  
  - **Base free-flow Speed, BFFS**: 70.0 mi/h  
- **LOS and Performance Measures**:  
  - **Operational (LOS)**:  
    - \( v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{hy} \times f_p) \) pch/ln  
    - \( S = v_p / S \) pc/mi/ln  
    - **LOS**:  
  - **Planning (LOS)**:  
    - \( F \)  
- **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  

### Site Information
- **Highway/Direction of Travel**: I-4/Eastbound  
- **From/To**: Lake Mary Blvd /CR  
- **Jurisdiction**: 46A/SR417  
- **Analysis Year**: 2032 Build  
- **Planning Data**:  

### Operational (LOS) Output
- **FFS, N, v_p**: LOS, S, D  
- **Design (N)**:  
  - **ffw**: Exhibit 23-4  
  - **flc**: Exhibit 23-5  
  - **fn**: Exhibit 23-6  
- **Design (LOS)**:  
  - **ffs, N, AADT**: LOS, S, D  
- **Planning (LOS)**:  
  - **ffs, LOS, N**: v_p, S, D  
- **Planning (N)**:  
  - **ffs, LOS, AADT**: N, S, D

### Simplified Flow Calculation
- \( f_{hv} = 1/(1 + P_{t} (E_{t} - 1) + P_{r}(E_{r} - 1)) \)  
- **Calc Speed Adj and FFS**:  
  - **f_{LW}**: 0.0 mi/h  
  - **f_{LC}**: 0.0 mi/h  
  - **f_{ID}**: 0.0 mi/h  
  - **f_{N}**: 3.0 mi/h  
  - **FFS**: 67.0 mi/h  

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

### Factor Location
- \( E_{R} \) - Exhibits 23-8, 23-10  
- \( f_{lw} \) - Exhibit 23-4  
- \( f_{lc} \) - Exhibit 23-5  
- \( f_{n} \) - Exhibit 23-6  
- \( f_{id} \) - Exhibit 23-7
# Basic Freeway Segments Worksheet

## General Information
- **Analyst**: KNM
- **Agency or Company**: HNTB
- **Date Performed**: 3/25/2008
- **Analysis Time Period**: Peak
- **Project Description**: Wekiva Parkway PD&E

## Site Information
- **Highway/Direction of Travel**: I-4/Eastbound
- **From/To**: CR 46A/SR 417/SR 46
- **Jurisdiction**: Analysis Year
- **Planning Data**: 2032 Build

## Flow Inputs
- **Volume, V**: 4820 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: 
- **Peak-Hr Direction Prop, D**: 
- **DDHV = AADT x K x D**: veh/h
- **Driver type adjustment**: 1.00

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

## Speed Inputs
- **Lane Width**: 12.0 ft
- **Rt-Shoulder Lat. Clearance**: 6.0 ft
- **Interchange Density**: 0.54 l/mi
- **Number of Lanes, N**: 3
- **FFS (measured)**: mi/h
- **Base free-flow speed, BFFS**: 70.0 mi/h

## LOS and Performance Measures
- **Operational (LOS)**
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_H \times f_p)} \)
  - \( S = 65.6 \text{ m/h} \)
  - \( D = \frac{v_p}{S} \)
  - \( LOS = D \)

## Design (N)
- **Design (N)**
  - Design LOS
  - \( v_p = \frac{(V \text{ or } DDHV)}{(PHF \times N \times f_H \times f_p)} \)
  - \( S \)
  - \( D = \frac{v_p}{S} \)
  - \( LOS = D \)

## 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: KNM
Agency or Company: HNTB
Date Performed: 3/25/2008
Analysis Time Period: Peak
Project Description: Wekiva Parkway PD&E

Site Information
Highway/Direction of Travel: I-4/Eastbound
From/To: SR 46/US17/92
Jurisdiction: Analysis Year: 2032 Build

Flow Inputs
Volume, V: 7130 veh/h
AADT: veh/day
Peak-Hr Prop. of AADT, K:
Peak-Hr Direction Prop, D:
DDHV = AADT x K x D:
Driver type adjustment:

Calculate Flow Adjustments

E_R:

Speed Inputs
Lane Width: 12.0 ft
Rt-Shoulder Let. Clearance: 6.0 ft
Interchange Density: 0.67 l/mi
Number of Lanes, N: 4
FFS (measured): mi/h
Base free-flow Speed, BFFS: 70.0 mi/h

LOS and Performance Measures
Operational (LOS):

Calc Speed Adj and FFS

Design (N)

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

Design (N)

Factor Location

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**BASIC FREEWAY SEGMENTS WORKSHEET**

### General Information
- **Analyst:** KNM
- **Agency or Company:** HNTB
- **Date Performed:** 3/25/2008
- **Analysis Time Period:** Peak
- **Project Description:** Wekiva Parkway PD&E

### Site Information
- **Highway/Direction of Travel:** I-4/Eastbound
- **From/To:** Us17/92 to Volusia County Line
- **Jurisdiction:**
- **Analysis Year:** 2032 Build

### Flow Inputs
- **Volume, V:** 6560 veh/h
- **AADT:** veh/day
- **Peak-Hr Prop. of AADT, K:**
- **Peak-Hr Direction Prop, D:**
- **DDHV = AADT x K x D:** veh/h
- **Driver type adjustment:** 1.00

### 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)]** 0.957

### Speed Inputs
- **Lane Width:** 12.0 ft
- **Rt-Shoulder Lat. Clearance:** 6.0 ft
- **Interchange Density:** 2.00 l/mi
- **Number of Lanes, N:** 3
- **FFS (measured):** 70.0 mi/h
- **Base free-flow speed, BFFS:** 70.0 mi/h

### LOS and Performance Measures
- **Operational (LOS):**
  - **v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p) 2405** pc/h/ln
- **D = v_p / S** mi/h
- **LOS**

### Calc Speed Adj and FFS
- **f_{LV}** 0.0 mi/h
- **f_{LC}** 0.0 mi/h
- **f_{ID}** 7.5 mi/h
- **f_N** 3.0 mi/h
- **FFS** 59.5 mi/h

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

### Factor Location
- **E_R - Exhibits 23-8, 23-10**
- **E_t - Exhibits 23-8, 23-10, 23-11**
- **f_p - Page 23-12**
- **LOS, S, FFS, v_p - Exhibits 22-3, 23-3**

### 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
- **Analyst**: KNM
- **Agency or Company**: HNTB
- **Date Performed**: 3/25/2008
- **Analysis Time Period**: Peak
- **Project Description**: Wekiva Parkway PD&E

### Site Information
- **Highway/Direction of Travel**: SR 417/Westbound
- **From/To**: North of Rinehart Rd/Rinehart
- **Jurisdiction**: Analysis Year 2032 Build

### Flow Inputs
- **Volume, V**: 6150 veh/h
- **AADT**: 6150 veh/day
- **Peak-Hr Prop. of AADT, K**: 1
- **Peak-Hr Direction Prop, D**: 1
- **DDHV = AADT x K x D**:veh/h
- **Driver type adjustment**: 1.00

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

### Speed Inputs
- **Lane Width**: 12.0 ft
- **Rt-Shoulder Lat. Clearance**: 6.0 ft
- **Interchange Density**: 0.40 l/mi
- **Number of Lanes, N**: 3
- **FFS (measured)**: mi/h
- **Base free-flow Speed, BFFS**: 70.0 mi/h

### LOS and Performance Measures
- **Operational (LOS)**
- **v_p**: (V or DDHV) / (PHF x N x f_p) 2266 pc/h/ln
- **S**: 56.3 mi/h
- **D**: v_p / S
- **LOS**: E

### Design (N)
- **Design (N)**
- **Design LOS**
- **v_p**: (V or DDHV) / (PHF x N x f_p) pc/h
- **S**: mi/h
- **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 23-8, 23-10
- **f_{1,w}**: Exhibits 23-4
- **E_p**: Exhibits 23-8, 23-10, 23-11
- **f_{1,c}**: Exhibits 23-5
- **f_p**: Page 23-12
- **f_{1,n}**: Exhibits 23-6
- **LOS, S, FFS, v_p**: Exhibits 23-2, 23-3
- **f_{1,d}**: Exhibits 23-7

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### General Information

- **Analyst**: KNM
- **Agency or Company**: HNTB
- **Date Performed**: 3/25/2008
- **Analysis Time Period**: Peak
- **Project Description**: Wekiva Parkway PD&E

### Site Information

- **Highway/Direction of Travel**: SR 417/Westbound
- **From/To**: Rinehart Rd to I-4
- **Jurisdiction**: Analysis Year: 2032 Build

### Flow Inputs

- **Volume, V**: 5420 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: Peak
- **Peak-Hr Direction Prop, D**: veh/h
- **Driver type adjustment**: 1.00

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Calculation</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>
</tbody>
</table>

### Speed Inputs

- **Lane Width**: 12.0 ft
- **Rt-Shoulder Lat. Clearance**: 6.0 ft
- **Interchange Density**: 2.00 l/mi
- **Number of Lanes, N**: 3
- **FFS (measured)**: mi/h
- **Base free-flow Speed, BFFS**: 70.0 mi/h

### LOS and Performance Measures

- **Operational (LOS)**
  - $v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p)$
  - 1997 pc/h/ln
  - $S$ = 57.6 mi/h
  - $D = v_p / S$ = 34.7 pc/mi/ln
  - LOS

### Design (N)

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

### Design Location

- $E_R$ - Exhibits 23-8, 23-10
- $f_{HW}$ - Exhibit 23-4
- $E_T$ - Exhibits 23-8, 23-10, 23-11
- $f_{LC}$ - Exhibit 23-5
- $f_p$ - Page 23-12
- $f_N$ - Exhibit 23-6
- LOS, S, FFS, $v_p$ - Exhibits 23-2, 23-3
- $f_{ID}$ - Exhibit 23-7
### General Information

**Analyst:** KNM  
**Agency or Company:** HNTB  
**Date Performed:** 3/25/2008  
**Analysis Time Period:** Peak  
**Project Description:** Wekiva Parkway PD&E

### Site Information

**Highway/Direction of Travel:** SR 417/Westbound  
**From/To:** I-4 to CD Road  
**Jurisdiction:**  
**Analysis Year:** 2032 Build

### Flow Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V</td>
<td>4460 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>
<tr>
<td>Driver type adjustment</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**Peak-Hour Factor, PHF:** 0.95  
**%Trucks and Buses, P_T:** 10  
**%RVs, P_R:** 0  
**Grade:**  
**Level:**  
**% Length:**  
**Up/Down %:**  

### Calculate Flow Adjustments

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>f_b</td>
<td>1.00</td>
</tr>
<tr>
<td>E_t</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**E_R:** 1.2  
**f_{HV} = \frac{1}{\left[1 + \frac{f_b E_t}{E_R - 1}\right] + \frac{f_t}{P_t E_R}}:** 0.952

### Speed Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width</td>
<td>12.0 ft</td>
</tr>
<tr>
<td>Rt-Shoulder Lat. Clearance</td>
<td>6.0 ft</td>
</tr>
<tr>
<td>Interchange Density</td>
<td>2.00 l/mi</td>
</tr>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
</tr>
<tr>
<td>FFS (measured)</td>
<td></td>
</tr>
<tr>
<td>Base free-flow Speed, BFFS</td>
<td>70.0 mi/h</td>
</tr>
</tbody>
</table>

### LOS and Performance Measures

**Operational (LOS)**

\[ v_p = \frac{(V \text{ or DDHV})}{(PHF \times N \times f_{HV} \times f_p)} \times 1643 \]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>59.5 mi/h</td>
</tr>
<tr>
<td>D = v_p / S</td>
<td>27.5 pc/mi/ln</td>
</tr>
<tr>
<td>LOS</td>
<td>D</td>
</tr>
</tbody>
</table>

### Design (N)

**Design (N)**

**Design LOS**

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td></td>
</tr>
<tr>
<td>D = v_p / S</td>
<td></td>
</tr>
</tbody>
</table>

### Glossary

<table>
<thead>
<tr>
<th>Parameter</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>
</tbody>
</table>

**DDHV - Directional design hour volume**

**Factor Location**

- **E_R - Exhibits 23-8, 23-10:** f_{lw} - Exhibit 23-4  
- **E_t - Exhibits 23-8, 23-10, 23-11:** f_LC - Exhibit 23-5  
- **f_p - Page 23-12**  
- **LOS, S, FFS, v_p - Exhibits 23-2, 23-3:** f_ID - Exhibit 23-7

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Fax: 
E-mail: 

--- Diverge Analysis ---

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 08/03/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** SR 417 WB  
**Junction:** Off Ramp to I-4 EB/WB  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

--- Freeway Data ---

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>4</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>5310 vph</td>
</tr>
</tbody>
</table>

--- Off Ramp Data ---

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1960 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>0 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>1500 ft</td>
</tr>
</tbody>
</table>

--- Adjacent Ramp Data (if one exists) ---

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>1260 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>3765 ft</td>
</tr>
</tbody>
</table>

--- Conversion to pc/h Under Base Conditions ---

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>5310</td>
<td>1960</td>
<td>1260 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1443</td>
<td>533</td>
<td>342 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00 %</td>
<td>0.00 %</td>
<td>0.00 %</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Heavy vehicle adjustment, FHV</td>
<td>0.952</td>
<td>0.952</td>
<td></td>
</tr>
<tr>
<td>Driver population factor, FP</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>
Estimation of V12 Diverge Areas

\[ L = \text{EQ} \]
\[ P = 0.260 \text{ Using Equation 0} \]
\[ V = V + \left( V - V \right) \text{ PC/h} \]
\[ 12 \overline{R} \overline{F} \overline{R} \overline{FD} \]

Capacity Checks

\[
\begin{array}{ccc}
V & \text{Actual} & \text{Maximum} & \text{LOS F?} \\
\text{Fi Fi} & 6060 & 9000 & \text{No} \\
\text{v} & 3823 & 9000 & \text{No} \\
\text{FO FO} & 2237 & 3800 & \text{No} \\
\text{R v} & 1414 \text{ PC/h} & \text{(Equation 25-15 or 25-16)} & \\
3 \text{ or av34} & & & \\
\text{Is v} \geq 2700 \text{ PC/h?} & \text{No} & \\
\text{Is v} \geq 1.5 \text{ v/2} & \text{No} & \\
\text{If yes, v} = 3231 & \text{(Equation 25-18)} & \\
12A & & & \\
\end{array}
\]

Flow Entering Diverge Influence Area

\[
\begin{array}{ccc}
V & \text{Actual} & \text{Max Desirable} & \text{Violation?} \\
\text{12} & 3231 & 4400 & \text{No} \\
\end{array}
\]

Level of Service Determination (if not F)

Density, \[ D = 4.252 + 0.0086 V - 0.009 \text{ L = 18.5 pc/mi/ln} \]

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, \[ D = 0.629 \]
Space mean speed in ramp influence area, \[ S = 46.8 \text{ mph} \]
Space mean speed in outer lanes, \[ S = 58.7 \text{ mph} \]
Space mean speed for all vehicles, \[ S = 51.7 \text{ mph} \]
Diverge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 03/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: SR 417 WB
Junction: Off Ramp to I-4 EB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 3
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 5310 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 2
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 1960 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: 500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 1260 vph
Position of adjacent ramp: Downstream
Type of adjacent ramp: Off
Distance to adjacent ramp: 3765 ft

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>5310</td>
<td>1960</td>
<td>1260</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15  1475  544  350  v
Trucks and buses  0  0  0  %
Recreational vehicles  0  0  0  %
Terrain type:  Level  Level  Level
  Grade  0.00  %  0.00  %  0.00  %
  Length  0.00  mi  0.00  mi  0.00  mi
Trucks and buses PCE, ET  1.5  1.5  1.5
Recreational vehicle PCE, ER  1.2  1.2  1.2
Heavy vehicle adjustment, fHV  1.000  1.000  1.000
Driver population factor, fP  1.00  1.00  1.00
Flow rate, vp  5900  2178  1400  pcph

Estimation of V12 Diverge Areas

\[ \text{L} = \text{(Equation 25-8 or 25-9)} \]
\[ \text{EQ} \]
\[ P = 0.450 \quad \text{Using Equation 0} \]
\[ \text{FD} \]
\[ v = v' + (v - v') \quad P = 3853 \quad \text{pc/h} \]
\[ 12 \quad \text{R} \quad \text{F} \quad \text{R} \quad \text{FD} \]

Capacity Checks

\[ v = v' \]
\[ v = 5900 \quad 6750 \quad \text{No} \]
\[ \text{Fi} \quad \text{F} \]
\[ v = v' - v \]
\[ v = 3722 \quad 6750 \quad \text{No} \]
\[ \text{FO} \quad \text{F} \quad \text{R} \]
\[ v = 2178 \quad 3800 \quad \text{No} \]
\[ \text{R} \]
\[ v = 2047 \text{pc/h} \quad \text{(Equation 25-15 or 25-16)} \]
\[ 3 \text{ or av34} \]
\[ v > 2700 \text{pc/h}? \quad \text{No} \]
\[ 3 \text{ or av34} \]
\[ v > 1.5 \frac{v}{2} \quad \text{No} \]
\[ 3 \text{ or av34} \]
\[ 12 \]
\[ \text{If yes, } v = 3853 \quad \text{(Equation 25-18)} \]
\[ 12A \]

Flow Entering Diverge Influence Area

\[ v = 3853 \quad 4400 \quad \text{No} \]
\[ 12 \]

Level of Service Determination (if not F)

Density,
\[ D = 4.252 + 0.0086 v - 0.009 \quad L = 23.9 \quad \text{pc/mi/ln} \]
\[ 12 \quad D \]
Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,
\[ D = 0.624 \]
\[ S \]
Space mean speed in ramp influence area,
\[ S = 46.9 \quad \text{mph} \]
R

Space mean speed in outer lanes, 0
S = 56.3  mph

Space mean speed for all vehicles, S = 49.8  mph
### Diverge Analysis

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/30/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** SR 417 WB  
**Junction:** Off Ramp to International Pkwy  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>3350 vph</td>
</tr>
</tbody>
</table>

### Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1260 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>0 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>1160 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>2076 ft</td>
</tr>
</tbody>
</table>

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>3350</td>
<td>1260</td>
<td>1160 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>910</td>
<td>342</td>
<td>315</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>11</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>Actual</td>
<td>Max</td>
<td>Violation?</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------</td>
<td>-----</td>
<td>------------</td>
</tr>
<tr>
<td>Flow Entering Diverge Influence Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>2877</td>
<td>4400</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of Service Determination (if not F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density, D = 4.252 + 0.00086 v - 0.009 L</td>
<td>29.0</td>
<td>pc/mi/ln</td>
<td></td>
</tr>
<tr>
<td>R 12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed Estimation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate speed variable,</td>
<td>D = 0.558</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Space mean speed in ramp influence area,</td>
<td>S = 47.7</td>
<td>mph</td>
<td></td>
</tr>
<tr>
<td>Space mean speed in outer lanes,</td>
<td>S = 60.3</td>
<td>mph</td>
<td></td>
</tr>
<tr>
<td>Space mean speed for all vehicles,</td>
<td>S = 50.4</td>
<td>mph</td>
<td></td>
</tr>
</tbody>
</table>
Diverge Analysis

Analyst: CTR
Agency/Co.: HNTB
Date performed: 07/30/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: SR 417 WB
Junction: Off Ramp to International Pkwy
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 3
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 3350 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 1
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 1260 vph
Length of first accel/decel lane: 0 ft
Length of second accel/decel lane: ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 1960 vph
Position of adjacent ramp: Upstream
Type of adjacent ramp: Off
Distance to adjacent ramp: 3765 ft

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>3350</td>
<td>1260</td>
<td>1960</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>910</td>
<td>342</td>
<td>533</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV 0.948 0.948 0.948
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vF 3842 1445 2248 pcph

Estimation of V12 Diverge Areas

\[ L = \text{EQ} \]
\[ P = 0.597 \text{ Using Equation 5} \]
\[ v = v + (v - v) P = 2877 \text{ pc/h} \]
\[ 12 \quad R \quad F \quad R \quad FD \]

Capacity Checks

<table>
<thead>
<tr>
<th>v = v</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fi  F</td>
<td>3842</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>v = v - v</td>
<td>2397</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>FO  F  R</td>
<td>[ v ]</td>
<td>1445</td>
<td>2000</td>
</tr>
<tr>
<td>R</td>
<td>[ v ]</td>
<td>965 pc/h</td>
<td>[ (Equation 25-15 or 25-16) ]</td>
</tr>
<tr>
<td>Is [ v ] [ v ] &gt; 2700 pc/h?</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is [ v ] [ v ] &gt; 1.5 [ \frac{v}{2} ]</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, [ v = 2877 ]</td>
<td>[ (Equation 25-18) ]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>2877</td>
<td>4400</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density,
\[ D = 4.252 + 0.0086 v - 0.009 \quad L = 29.0 \quad \text{pc/mi/ln} \]
\[ R \quad 12 \quad D \]
Level of service for ramp-freeway junction areas of influence D \[ \checkmark \]

Speed Estimation

Intermediate speed variable,
\[ D = 0.558 \]
\[ S \]
Space mean speed in ramp influence area,
\[ S = 47.7 \quad \text{mph} \]
\[ R \]
Space mean speed in outer lanes,
\[ S = 60.3 \quad \text{mph} \]
\[ 0 \]
Space mean speed for all vehicles,
\[ S = 50.4 \quad \text{mph} \]

Merge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 03/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: SR 417 WB
Junction: On Ramp from I-4 EB & WB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2090 vph</td>
</tr>
</tbody>
</table>

On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1160 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1325 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>1260 vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Upstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>2076 ft</td>
</tr>
</tbody>
</table>

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, ( V ) (vph)</td>
<td>2090</td>
<td>1160</td>
<td>1260</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15
Trucks and buses
Recreational vehicles
Terrain type:
Grade
Length
Trucks and buses PCE, ET
Recreational vehicle PCE, ER
Heavy vehicle adjustment, fHV
Driver population factor, fP
Flow rate, vp

Estimation of V12 Merge Areas

\[ L = 789.25 \]  (Equation 25-2 or 25-3)

\[ P = 0.615 \]  Using Equation 1

\[ F M \]

\[ v = v(P) = 1427 \text{ pc/h} \]

\[ F M \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>3611</td>
<td>6750</td>
</tr>
</tbody>
</table>

EO

\[ v = 895 \text{ pc/h} \]  (Equation 25-4 or 25-5)

Is \[ v > 2700 \text{ pc/h?} \]  No

Is \[ v > 1.5 v /2 \]  No

If yes, \[ v = 1427 \]  (Equation 25-8)

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>1427</td>
<td>4600</td>
</tr>
</tbody>
</table>

R12

Level of Service Determination (if not F)

Density, \[ D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 17.8 \text{ pc/mi/in} \]

R12

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,
\[ M = 0.287 \]

Space mean speed in ramp influence area,
\[ S = 51.3 \text{ mph} \]

Space mean speed in outer lanes,
\[ S = 53.6 \text{ mph} \]

Space mean speed for all vehicles,
\[ S = 51.8 \text{ mph} \]
**Merge Analysis**

**Analyst:** CTRR  
**Agency/Co.:** HNTB  
**Date performed:** 03/05/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** SR 417 WB  
**Junction:** On Ramp from I-4 EB & WB  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2090 vph</td>
</tr>
</tbody>
</table>

### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1160 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1325 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>680 vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>1325 ft</td>
</tr>
</tbody>
</table>

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2090</td>
<td>1160</td>
<td>680</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>581 322 189 v</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>0 0 0 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0 0 0 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level Level Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>% % %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>mi mi mi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5 1.5 1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2 1.2 1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy vehicle adjustment, fHV</td>
<td>1.000 1.000 1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver population factor, fP</td>
<td>1.00 1.00 1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow rate, vp</td>
<td>2322 1289 756 pcph</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Estimation of V12 Merge Areas**

\[ L = \text{(Equation 25-2 or 25-3)} \]

\[ P = 0.615 \text{ Using Equation 1} \]

\[ v = v (P) = 1427 \text{ pc/h} \]

\[ 12 \text{ F FM} \]

---

**Capacity Checks**

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v 3611</td>
<td>6750</td>
<td>No</td>
</tr>
</tbody>
</table>

\[ v 895 \text{ pc/h} \text{ (Equation 25-4 or 25-5)} \]

3 or av34

\[ v > 2700 \text{ pc/h} ? \text{ No} \]

3 or av34

\[ v > 1.5 v /2 \text{ No} \]

3 or av34 12

If yes, \[ v = 1427 \text{ (Equation 25-8)} \]

12A

---

**Flow Entering Merge Influence Area**

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v 1427</td>
<td>4600</td>
<td>No</td>
</tr>
</tbody>
</table>

---

**Level of Service Determination (if not F)**

\[ D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 17.8 \text{ pc/mi/ln} \]

\[ R \text{ R 12 A} \]

**Level of service for ramp-freeway junction areas of influence B**

---

**Speed Estimation**

Intermediate speed variable, \[ M = 0.287 \]

Space mean speed in ramp influence area, \[ S = 51.3 \text{ mph} \]

Space mean speed in outer lanes, \[ S = 53.6 \text{ mph} \]

Space mean speed for all vehicles, \[ S = 51.8 \text{ mph} \]
**HCS+: Ramps and Ramp Junctions Release 5.4**

**Phone:**  
**Fax:**  
**E-mail:**

---

### Merge Analysis

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 08/03/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** SR 417 WB  
**Junction:** On Ramp from International Pwy  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>4 ✓</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>3250 vph</td>
</tr>
</tbody>
</table>

### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1 ✓</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>680 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>900 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>1160 vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Upstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>1325 ft</td>
</tr>
</tbody>
</table>

---

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>3250</td>
<td>680</td>
<td>1160 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>883</td>
<td>185</td>
<td>315 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>11</td>
<td>9</td>
<td>9 %</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Estimation of V12 Merge Areas

\[ L = \text{EQ} \]
\[ P = 0.121 \quad \text{Using Equation 4} \]
\[ v = v \cdot (P_{FM}) = 452 \quad \text{pc/h} \]
\[ 12 \quad F_{FM} \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>4499</td>
<td>9000</td>
</tr>
<tr>
<td>FO</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>v</td>
<td>1637 pc/h</td>
<td>(Equation 25-4 or 25-5)</td>
</tr>
<tr>
<td>v_{av34}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v \cdot v_{av34} &gt; 2700 pc/h?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Is v \cdot v_{av34} &gt; 1.5 \cdot v_{av34} \cdot 12</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>If yes, v = 2700 pc/h?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, v = 1490</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>1490</td>
<td>4600</td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, \[ D = 5.475 + 0.00734 \cdot v + 0.0078 \cdot v - 0.00627 \cdot L = 17.1 \quad \text{pc/mi/ln} \]

Level of service for ramp-freeway junction areas of influence B \( \checkmark \)

Speed Estimation

Intermediate speed variable, \( M = 0.295 \)
Space mean speed in ramp influence area, \( S = 51.2 \quad \text{mph} \)
Space mean speed in outer lanes, \( S = 52.8 \quad \text{mph} \)
Space mean speed for all vehicles, \( S = 52.0 \quad \text{mph} \)
HCS+: Ramps and Ramp Junctions Release 5.4

---

**Diverge Analysis**

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/30/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** SR 417 EB  
**Junction:** Off Ramp to International Pkwy  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

**Freeway Data**

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>3930 vph</td>
</tr>
</tbody>
</table>

---

**Off Ramp Data**

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>680 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>0 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

**Adjacent Ramp Data (if one exists)**

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>1160 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>1250 ft</td>
</tr>
</tbody>
</table>

---

**Conversion to pc/h Under Base Conditions**

**Junction Components**

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3930</td>
<td>680</td>
<td>1160</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1060</td>
<td>185</td>
<td>315</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type: Grade</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Estimation of V12 Diverge Areas

\[ L = 1853.76 \quad (\text{Equation 25-8 or 25-9}) \]

\[ EQ \]

\[ P = 0.684 \quad \text{Using Equation 7} \]

\[ FD \]

\[ v = v + (v - v) \quad P = 3218 \quad \text{pc/h} \]

\[ 12 \quad R \quad F \quad R \quad FD \]

Capacity Checks

\[ v = v \quad \text{Actual} \quad \text{Maximum} \quad \text{LOS F?} \]

\[ 4507 \quad 6750 \quad \text{No} \]

\[ F_i = F \]

\[ v = v - v \quad \text{FO} \quad F \quad R \]

\[ 3727 \quad 6750 \quad \text{No} \]

\[ v \quad \text{R} \]

\[ 780 \quad 2000 \quad \text{No} \]

\[ v \quad \text{3 or av34} \]

\[ 1289 \quad \text{pc/h} \quad (\text{Equation 25-15 or 25-16}) \]

\[ \text{Is } v \quad \text{v} \quad > 2700 \quad \text{pc/h?} \quad \text{No} \]

\[ \text{Is } v \quad v \quad > 1.5 \quad v /2 \quad \text{No} \]

\[ \text{If yes, } v \quad = 3218 \quad (\text{Equation 25-18}) \]

\[ 12A \]

Flow Entering Diverge Influence Area

\[ v \quad \text{Actual} \quad \text{Max Desirable} \quad \text{Violation?} \]

\[ 3218 \quad 4400 \quad \text{No} \]

Level of Service Determination (if not F)

\[ D = 4.252 + 0.0086 \quad v - 0.009 \quad L = 31.9 \quad \text{pc/mi/ln} \]

\[ R \quad 12 \quad D \]

Density, Level of service for ramp-freeway junction areas of influence \( D \)

Speed Estimation

Intermediate speed variable, \( D = 0.498 \)

Space mean speed in ramp influence area, \( S = 48.5 \quad \text{mph} \)

Space mean speed in outer lanes, \( S = 59.2 \quad \text{mph} \)

Space mean speed for all vehicles, \( S = 51.2 \quad \text{mph} \)
Diverge Analysis

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/30/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: SR 417 EB
Junction: Off Ramp to I-4 EB & WB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 3
Free-flow speed on freeway: 65.0 mph
Volume on freeway: 3250 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 1
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 1160 vph
Length of first accel/decel lane: 0 ft
Length of second accel/decel lane: ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 1210 vph
Position of adjacent ramp: Downstream
Type of adjacent ramp: On
Distance to adjacent ramp: 1964 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>3250</td>
<td>1160</td>
<td>1210</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak-hour factor, PHF</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak 15-min volume, v15</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>883</td>
<td>315</td>
<td>329</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trucks and buses</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>11</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recreational vehicles</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terrain type:</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trucks and buses PCE, ET</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recreational vehicle PCE, ER</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Estimation of VI2 Diverge Areas

\[ L = \quad \text{(Equation 25-8 or 25-9)} \]
\[ LQ \quad P = 0.606 \quad \text{Using Equation 5} \]
\[ FD \quad v = v + (v - v) P = 2782 \text{ pc/h} \]
\[ 12 \quad R \quad F \quad R \quad FD \]

### Capacity Checks

<table>
<thead>
<tr>
<th>( v = v )</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>( Fi ) ( F )</td>
<td>3727</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>( v = v - v )</td>
<td>2397</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>( FO ) ( F ) ( R )</td>
<td>1330</td>
<td>2000</td>
<td>No</td>
</tr>
<tr>
<td>( R )</td>
<td>( v ) ( v ) ( 945 \text{ pc/h} )</td>
<td>( 3 \text{ or av34} )</td>
<td>( (\text{Equation 25-15 or 25-16}) )</td>
</tr>
</tbody>
</table>

Is \( v \) \( v \) \( > 2700 \text{ pc/h?} \) No

Is \( v \) \( v \) \( > 1.5 \frac{v}{2} \) \( 3 \text{ or av34} \) No

If yes, \( v = 2782 \) \( 3 \text{ or av34} \) \( 12 \) \( (\text{Equation 25-18}) \)

### Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>( v )</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 2782 )</td>
<td>( 4400 )</td>
<td>( 12 )</td>
<td>No</td>
</tr>
</tbody>
</table>

### Level of Service Determination (if not F)

\[ D = 4.252 + 0.0086 v - 0.009 L = 28.2 \text{ pc/mi/ln} \]

\[ \frac{R}{D} \]

Level of service for ramp-freeway junction areas of influence \( D \checkmark \)

### Speed Estimation

<table>
<thead>
<tr>
<th>Intermediate speed variable,</th>
<th>( D = 0.548 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space mean speed in ramp influence area,</td>
<td>( S = 47.9 \text{ mph} )</td>
</tr>
<tr>
<td>Space mean speed in outer lanes,</td>
<td>( S = 60.3 \text{ mph} )</td>
</tr>
<tr>
<td>Space mean speed for all vehicles,</td>
<td>( S = 50.5 \text{ mph} )</td>
</tr>
</tbody>
</table>
Diverge Analysis

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/30/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: SR 417 EB
Junction: Off Ramp to I-4 EB & WB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 3
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 3250 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 1
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 1160 vph
Length of first accel/decel lane: 0 ft
Length of second accel/decel lane: 0 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes
Volume on adjacent ramp: 680 vph
Position of adjacent ramp: Upstream
Type of adjacent ramp: Off
Distance to adjacent ramp: 1250 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>3250</td>
<td>1160</td>
<td>680</td>
<td></td>
</tr>
</tbody>
</table>

| Peak-hour factor, PHF | 0.92 | 0.92 |
| Peak 15-min volume, v15 | 883 | 315 |
| Trucks and buses | 11 | 11 |
| Recreational vehicles | 0 | 0 |
| Terrain type: | Level | Level | Level |
| Grade | 0.00 % | 0.00 % | 0.00 % |
| Length | 0.00 mi | 0.00 mi | 0.00 mi |
| Trucks and buses PCE, ET | 1.5 | 1.5 |
| Recreational vehicle PCE, ER | 1.2 | 1.2 |
Estimation of V12 Diverge Areas

\[
L = (\text{Equation 25-6 or 25-9})
\]

\[
P = 0.606 \quad \text{Using Equation 5}
\]

\[
v = v + (v - v) P = 2782 \quad \text{pc/h}
\]

Capacity Checks

<table>
<thead>
<tr>
<th>v = v</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fi F</td>
<td>3727</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>v = v - v</td>
<td>2397</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>FO F R</td>
<td>1330</td>
<td>2000</td>
<td>No</td>
</tr>
<tr>
<td>R</td>
<td>945 pc/h</td>
<td>(Equation 25-15 or 25-16)</td>
<td></td>
</tr>
</tbody>
</table>

| Is v > 2700 pc/h? | No |
| Is v > 1.5 v /2 | No |

If yes, v = 2782 pc/h (Equation 25-18)

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2782</td>
<td>4400</td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density,

\[
D = 4.252 + 0.0086 v - 0.009 \quad L = 28/2 \quad \text{pc/mi/ln}
\]

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,

\[
D = 0.548
\]

Space mean speed in ramp influence area,

\[
S = 47.9 \quad \text{mph}
\]

Space mean speed in outer lanes,

\[
S = 60.3 \quad \text{mph}
\]

Space mean speed for all vehicles,

\[
S = 50.5 \quad \text{mph}
\]
SR 417 EB On Ramp From Int'l Pkwy_Upsream Analysis.txt

HCS+: Ramps and Ramp Junctions Release 5.4

Phone:  
Fax:  
E-mail:  

Merge Analysis

Analyst: CTR  
Agency/Co.: HNTB  
Date performed: 7/30/2010  
Analysis time period: Build Service Road Concept  
Freeway/Dir of Travel: SR 417 EB  
Junction: On Ramp from International Pky  
Jurisdiction: Seminole County  
Analysis Year: 2032  
Description: Wekiva Parkway Project Development & Environment Project

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2090 vph</td>
</tr>
</tbody>
</table>

On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1210 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1200 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

| Does adjacent ramp exist? | Yes |
| Volume on adjacent Ramp | 1160 vph |
| Position of adjacent Ramp | Upstream |
| Type of adjacent Ramp | Off |
| Distance to adjacent Ramp | 1964 ft |

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2090</td>
<td>1210</td>
<td>1160</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
<td>vph</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>568</td>
<td>329</td>
<td>315</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>11</td>
<td>10</td>
<td>10</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
<td>%</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Heavy vehicle adjustment, fHV</td>
<td>0.948</td>
<td>0.952</td>
<td>0.952</td>
<td></td>
</tr>
<tr>
<td>Driver population factor, fp</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Page 1
Estimation of V12 Merge Areas

\[ L = 769.49 \text{ (Equation 25-2 or 25-3)} \]
\[ P = 0.611 \text{ Using Equation 1} \]
\[ v_{12} = v_{12} \left( \frac{P}{F} \right) = 1465 \text{ pc/h} \]

Capacity Checks

<table>
<thead>
<tr>
<th>[ v ]</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOF F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ v_{F0} ]</td>
<td>3778</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>[ v_{3 \text{ or } av34} ]</td>
<td>932 pc/h</td>
<td>(Equation 25-4 or 25-5)</td>
<td></td>
</tr>
<tr>
<td>Is [ v_{3 \text{ or } av34} &gt; 2700 \text{ pc/h?} ]</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is [ v_{12} &gt; 1.5 \frac{v_{\text{av34}}}{2} ]</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, [ v_{12A} = 1465 \text{ pc/h} ]</td>
<td>(Equation 25-8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>[ v ]</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ v_{R12} ]</td>
<td>1465</td>
<td>4600</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, \[ D = 5.475 + 0.00734 \frac{v}{K} + 0.0078 \frac{v}{K} - 0.00627 \frac{L}{A_{12}} \]

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, \[ M = 0.304 \]
Space mean speed in ramp influence area, \[ S = 51.0 \text{ mph} \]
Space mean speed in outer lanes, \[ S = 53.4 \text{ mph} \]
Space mean speed for all vehicles, \[ S = 51.6 \text{ mph} \]
### Merge Analysis

- **Analyst:** CTR
- **Agency/Co.:** HNTB
- **Date performed:** 7/30/2010
- **Analysis time period:** Build Service Road Concept
- **Freeway/Dir of Travel:** SR 417 EB
- **Junction:** On Ramp from International Pky
- **Jurisdiction:** Seminole County
- **Analysis Year:** 2032
- **Description:** Wekiva Parkway Project Development & Environment Project

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2090 vph</td>
</tr>
</tbody>
</table>

### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1210 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1200 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td></td>
</tr>
</tbody>
</table>

### Adjacent Ramp Data (if one exists)

- **Adjacent ramp exists:** Yes
- **Volume on adjacent ramp:** 2060 vph
- **Position of adjacent ramp:** Downstream
- **Type of adjacent ramp:** On
- **Distance to adjacent ramp:** 3106 ft

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2090</td>
<td>1210</td>
<td>2060 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>568</td>
<td>329</td>
<td>560 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>11</td>
<td>10</td>
<td>9 %</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Heavy vehicle adjustment, fHV</td>
<td>0.948</td>
<td>0.952</td>
<td>0.957</td>
</tr>
<tr>
<td>Driver population factor, fp</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Estimation of V12 Merge Areas

\[ L = \quad \text{(Equation 25-2 or 25-3)} \]
\[ P = 0.611 \quad \text{Using Equation 1} \]
\[ v = v \left( \frac{P}{F_{FM}} \right) = 1465 \quad \text{pc/h} \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_{3}</td>
<td>3778</td>
<td>6750</td>
</tr>
<tr>
<td>v_{av3}</td>
<td>932 pc/h</td>
<td></td>
</tr>
<tr>
<td>Is v_{3} or v_{av3} &gt; 2700 pc/h?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Is v_{3} or v_{av3} &gt; 1.5 \frac{v}{2}</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>If yes, v_{12} = 1465</td>
<td>(Equation 25-8)</td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v_{R12}</td>
<td>1465</td>
<td>4600</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

\[ D = 5.475 + 0.00734 v \times 0.0078 v - 0.00627 L = 19.5 \quad \text{pc/mi/ln} \]

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, \( M = 0.304 \)

Space mean speed in ramp influence area, \( S_{R} = 51.0 \quad \text{mph} \)

Space mean speed in outer lanes, \( S_{O} = 53.4 \quad \text{mph} \)

Space mean speed for all vehicles, \( S = 51.6 \quad \text{mph} \)
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: 
Fax: 
E-mail:

--- Merge Analysis ---

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/30/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: SR 417 EB
Junction: On Ramp from I-4 EB & WB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Project

--- Freeway Data ---

Type of analysis
Number of lanes in freeway
Free-flow speed on freeway
Volume on freeway

--- On Ramp Data ---

Left
Right
Number of lanes in ramp
Free-flow speed on ramp
Volume on ramp
Length of first accel/decel lane
Length of second accel/decel lane

--- Adjacent Ramp Data (if one exists) ---

Does adjacent ramp exist? Yes
Volume on adjacent Ramp
Position of adjacent Ramp Upstream
Type of adjacent Ramp
Distance to adjacent Ramp

--- Conversion to pc/h Under Base Conditions ---

Junction Components
Volume, V (vph)
Peak-hour factor, PHF
Peak 15-min volume, v15
Trucks and buses
Recreational vehicles
Terrain type:
Grade
Length
Trucks and buses PCE, ET
Recreational vehicle PCE, ER
Estimation of V12 Merge Areas

\[ L = \text{EQ} \]
\[ P = 0.555 \quad \text{Using Equation 0} \]
\[ v = v \left( \frac{P}{F} \right) = 2100 \quad \text{pc/h} \]
\[ 12 \quad F \quad FM \]

Capacity Checks

\[
\begin{align*}
\text{v} & \quad \text{Actual} \quad \text{Maximum} \quad \text{LOS F?} \\
\text{v} & \quad 6124 \quad 6750 \quad \text{No} \\
\text{PO} & \\
\text{v} & \quad 1684 \quad \text{pc/h} \quad \text{(Equation 25-4 or 25-5)} \\
\text{Is } v & \quad v > 2700 \quad \text{pc/h?} \\
\text{Is } v & \quad v > 1.5 \quad v /2 \\
\text{1 or av34} & \quad 3 \quad \text{or av34} \\
\text{If yes, } v & \quad = 2162 \\
\text{12A} & \\
\end{align*}
\]

Flow Entering Merge Influence Area

\[
\begin{align*}
\text{v} & \quad \text{Actual} \quad \text{Max Desirable} \quad \text{Violation?} \\
\text{v} & \quad 2162 \quad 4600 \quad \text{No} \\
\text{12A} & \\
\end{align*}
\]

Level of Service Determination (if not F)

\[
\text{Density, } D = 5.475 + 0.00734 \cdot v + 0.0078 \cdot v - 0.00627 \cdot L = 18.8 \quad \text{pc/mi/ln} \\
\text{R} \quad \text{R} \quad 12 \quad A \quad \text{B} \checkmark \\
\text{Level of service for ramp-freeway junction areas of influence B} \]

Speed Estimation

\[
\begin{align*}
\text{Intermediate speed variable, } M & = 0.442 \\
\text{Space mean speed in ramp influence area, } S & = 49.3 \quad \text{mph} \\
\text{Space mean speed in outer lanes, } S & = 51.0 \quad \text{mph} \\
\text{Space mean speed for all vehicles, } S & = 49.7 \quad \text{mph} \\
\end{align*}
\]
Diverge Analysis

Phone: 
Fax: 
E-mail: 

Analyst: CTR 
Agency/Co.: HNTB 
Date performed: 7/30/2010 
Analysis time period: Build Service Road Concept 
Freeway/Dir of Travel: SR 417 EB 
Junction: Off Ramp to Rinchart Rd 
Jurisdiction: Seminole County 
Analysis Year: 2032 
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 4
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 5360 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 1
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 620 vph
Length of first accel/decel lane: 0 ft
Length of second accel/decel lane: ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes
Volume on adjacent ramp: 1410 vph
Position of adjacent ramp: Downstream
Type of adjacent ramp: On
Distance to adjacent ramp: 2402 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5360</td>
<td>620</td>
<td>1410</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak-hour factor, PHF</th>
<th>0.92</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1457</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>10</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00</td>
</tr>
<tr>
<td>Length</td>
<td>0.00</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV
Driver population factor, FP
Flow rate, vp

<table>
<thead>
<tr>
<th></th>
<th>0.952</th>
<th>0.952</th>
<th>0.957</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>6117</td>
<td>700</td>
<td>1602</td>
</tr>
</tbody>
</table>

**Estimation of V12 Diverge Areas**

\[
L = \text{Equation 25-8 or 25-9} \\
B \bar{Q} \text{ Using Equation 8} \\
P = 0.436 \text{ F} \text{ R} \text{ FD} \\
\begin{align*}
v &= v + (v - v) F \\
&= 3066 \text{ pc/h} \\
&= 12 \text{ R} \text{ F} \text{ R} \text{ FD}
\end{align*}

**Capacity Checks**

\[
v = v \\
F_i = F \\
v = v - v \\
F_o \text{ F} \text{ R} \\
v = 5409 \text{ pc/h} \\
R \\
v = 708 \text{ pc/h} \\
3 \text{ or av34} \\
\text{Is } v > 2700 \text{ pc/h?} \text{ No}
\]

\[
v = v \\
3 \text{ or av34} \\
\text{Is } v > 1.5 \frac{v}{2} \text{ No}
\]

\[
\text{If yes, } v = 3066 \text{ pc/h} \\
12 \text{A}
\]

**Flow Entering Diverge Influence Area**

<table>
<thead>
<tr>
<th></th>
<th>3066</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
</table>
\[
v = v \\
12 \text{ F} \\
\]

**Level of Service Determination (if not F)**

\[
D = 4.252 + 0.0086 \bar{v} - 0.009 L = 30.6 \text{ pc/mi/ln} \\
R \text{ 12} \\
D
\]

**Density**

\[
D = 4.252 + 0.0086 \bar{v} - 0.009 L = 30.6 \text{ pc/mi/ln} \\
R \text{ 12} \\
D
\]

**Speed Estimation**

\[
\text{Intermediate speed variable, } D = 0.492 \\
\text{Space mean speed in ramp influence area, } S = 48.6 \text{ mph} \\
\text{Space mean speed in outer lanes, } S = 58.3 \text{ mph} \\
\text{Space mean speed for all vehicles, } S = 53.0 \text{ mph}
\]
Diverge Analysis

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/30/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: SR 417 EB
Junction: Off Ramp to Rinehart Rd
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 4
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 5360 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 1
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 620 vph
Length of first accel/decel lane: 0 ft
Length of second accel/decel lane: ft

Adjacent Ramp Data (if one exists):

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 2060 vph
Position of adjacent ramp: Upstream
Type of adjacent ramp: On
Distance to adjacent ramp: 3000 ft

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>5360</td>
<td>620</td>
<td>2060</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1457</td>
<td>168</td>
<td>560</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>10</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Length</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, FHV | 0.952 | 0.952 | 0.957
Driver population factor, TP | 1.00 | 1.00 | 1.00
Flow rate, yp | 6117 | 708 | 2340 pcph

**Estimation of V12 Diverge Areas**

\[
L = \text{(Equation 25-8 or 25-9)}
\]

\[
P = 0.436 \quad \text{Using Equation 6}
\]

\[
v = v + \frac{(v - v_F)}{R} \quad P = 3066 \quad \text{pc/h}
\]

\[
12 \quad R \quad F \quad R \quad FD
\]

**Capacity Checks**

\[
v = v_F
\]

\[
\begin{array}{ccc}
\text{Actual} & \text{Maximum} & \text{LOS F?} \\
6117 & 9000 & \text{No} \\
5409 & 9000 & \text{No} \\
708 & 2000 & \text{No} \\
\end{array}
\]

\[
v_3 \text{ or } av34
\]

\[
1525 \text{ pc/h} \quad (\text{Equation 25-15 or 25-16})
\]

Is \(v_3 \text{ or } av34 > 2700 \text{ pc/h?} \quad \text{No}

Is \(v_3 \text{ or } av34 > 1.5 \frac{v}{2} \quad \text{No}

If yes, \(v = 3066\) \quad (\text{Equation 25-18})

**Flow Entering Diverge Influence Area**

\[
v = 3066 \\
12\text{A}
\]

**Level of Service Determination (if not F)**

\[
D = 4.252 + 0.0086 \frac{v}{12} - 0.009 \quad L = 30.6 \quad \text{pc/mi/ln}
\]

Density, D

\[
\text{Level of service for ramp-freeway junction areas of influence D}
\]

**Speed Estimation**

Intermediate speed variable, \(D = 0.492\)

Space mean speed in ramp influence area, \(S = 48.6 \text{ mph}\)

Space mean speed in outer lanes, \(S = 58.3 \text{ mph}\)

Space mean speed for all vehicles, \(S = 53.0 \text{ mph}\)
Merge Analysis

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/30/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: SR 417 EB
Junction: On Ramp from Rinehart Rd
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0</td>
<td>mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>4740</td>
<td>vph</td>
</tr>
</tbody>
</table>

On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1410</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1000</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td></td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists):

| Does adjacent ramp exist? | Yes |
| Volume on adjacent Ramp | 620  | vph |
| Position of adjacent Ramp | Upstream |
| Type of adjacent Ramp | Off |
| Distance to adjacent Ramp | 2402 | ft |

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>4740</td>
<td>1410</td>
<td>620</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1247</td>
<td>371</td>
<td>163</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Estimation of V12 Merge Areas

\[ L = 1326.76 \text{ (Equation 25-2 or 25-3)} \]
\[ P = 0.605 \text{ Using Equation 1} \]
\[ v = v \left( \frac{P}{12} \right) = 3172 \text{ pc/h} \]

Capacity Checks

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>FO</td>
<td>6797</td>
<td>6750</td>
<td>Yes</td>
</tr>
<tr>
<td>v \left( \frac{P}{3} \right)</td>
<td>2067 pc/h</td>
<td>(Equation 25-4 or 25-5)</td>
<td></td>
</tr>
<tr>
<td>Is v \left( \frac{P}{3} \right) &gt; 2700 pc/h?</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v \left( \frac{P}{3} \right) &gt; 1.5 \frac{v}{12A}</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, v \left( \frac{P}{12A} \right) = 3172</td>
<td>(Equation 25-8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>R12</td>
<td>3172</td>
<td>4600</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, \[ D = 5.475 + 0.00734 \frac{v}{R} + 0.0078 \frac{v}{R} - 0.00627 \frac{L}{A} = 35.4 \text{ pc/mi/ln} \]

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, \[ M = 0.693 \]
Space mean speed in ramp influence area, \[ S_R = 46.0 \text{ mph} \]
Space mean speed in outer lanes, \[ S_0 = 49.4 \text{ mph} \]
Space mean speed for all vehicles, \[ S = 47.0 \text{ mph} \]
Diverge Analysis

Analyst: CTR  
Agency/Co.: HNTB  
Date performed: 7/30/2010  
Analysis time period: Build Service Road Concept  
Freeway/Dir of Travel: SR 417 WB  
Junction: Off Ramp to Rinehart Rd  
Jurisdiction: Seminole County  
Analysis Year: 2032  
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>6150 vph</td>
</tr>
</tbody>
</table>

Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1460 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>500 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>0 ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists):

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>620 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>1833 ft</td>
</tr>
</tbody>
</table>

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>6150</td>
<td>1460</td>
<td>620</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1618</td>
<td>384</td>
<td>163</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV 0.952 0.952 0.952
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 6797 1614 605 pcph

Estimation of V12 Diverge Areas

\[
L = \text{EQ} \\
P = 0.450 \quad \text{Using Equation 0} \\
v = v + (v - v) P = 3946 \text{ pc/h} \\
12 \quad R \quad F \quad R \quad FD
\]

Capacity Checks

\[
v = v \quad \text{Actual} \quad 6797 \\
Fi \quad F \\
v = v - v \quad \text{Max} \quad 6750 \\
FO \quad F \quad R \\
v \quad 1614 \\
R \\
v = 2851 \text{ pc/h} \quad \text{(Equation 25-15 or 25-16)} \\
3 \quad \text{or av34} \\
\text{Is } v \quad v > 2700 \text{ pc/h?} \quad \text{Yes} \\
3 \quad \text{or av34} \\
\text{Is } v \quad v > 1.5 \frac{v}{2} \quad \text{No} \\
3 \quad \text{or av34} \\
12 \\
\text{If yes, } v \quad = 4097 \quad \text{(Equation 25-18)} \\
12A
\]

Flow Entering Diverge Influence Area

\[
v \quad \text{Actual} \quad 4097 \\
12A \\
\text{Max Desirable} \quad 4400 \\
\text{Violation?} \quad \text{No}
\]

Level of Service Determination (if not F)

\[D = 4.252 + 0.0086 v - 0.009 L = 30.5 \text{ pc/mi/ln} \]

Density, \[R \quad 12 \quad D \]

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, \[
D = 0.573
\]

Space mean speed in ramp influence area, \[
S = 47.5 \text{ mph}
\]

Space mean speed in outer lanes, \[
S = 53.7 \text{ mph}
\]

Space mean speed for all vehicles, \[
S = 49.8 \text{ mph}
\]
**SR 417 WB ON Ramp from Rinehart.txt**

**HCS+: Ramps and Ramp Junctions Release 5.4**

---

**Phone:**

**Fax:**

**E-mail:**

---

**Merge Analysis**

**Analyst:** CTR

**Agency/Co.:** HNTB

**Date performed:** 8/03/2010

**Analysis time period:** Build Service Road Concept

**Freeway/Dir of Travel:** SR 417 WB

**Junction:** On Ramp from Rinehart Rd

**Jurisdiction:** Seminole County

**Analysis Year:** 2032

**Description:** Wekiva Parkway Project Development & Environment Study

---

**Freeway Data**

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>4690 vph</td>
</tr>
</tbody>
</table>

---

**On Ramp Data**

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>620 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1500 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

**Adjacent Ramp Data (if one exists)**

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>1460 vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Upstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>1700 ft</td>
</tr>
</tbody>
</table>

---

**Conversion to pc/h Under Base Conditions**

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>4690</td>
<td>620</td>
<td>1460 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1274</td>
<td>168</td>
<td>397 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>10</td>
<td>10</td>
<td>10 %</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Heavy vehicle adjustment, FHV</td>
<td>0.952</td>
<td>0.952</td>
<td>0.952</td>
</tr>
<tr>
<td>Driver population factor, fp</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

---

Page 1
Flow rate, vp

Estimation of V12 Merge Areas

\[ L = 1391.25 \text{ (Equation 25-2 or 25-3)} \]

\[ P = 0.619 \text{ Using Equation 1} \]

\[ V = V \left( P \right) = 3316 \text{ pc/h} \]

Capacity Checks

\[ v \]

\[ \text{Actual} \quad \text{Maximum} \quad \text{LOS F?} \]

\[ 6061 \quad 6750 \quad \text{No} \]

\[ 2037 \text{ pc/h} \]

\[ \text{(Equation 25-4 or 25-5)} \]

\[ v > 2700 \text{ pc/h?} \]

\[ 3 \text{ or av34} \]

\[ \text{No} \]

\[ v > 1.5 \frac{v}{2} \]

\[ 3 \text{ or av34} \]

\[ \text{No} \]

\[ \frac{v}{12} \]

\[ \text{(Equation 25-8)} \]

Flow Entering Merge Influence Area

\[ v \]

\[ \text{Actual} \quad \text{Max Desirable} \quad \text{Violation?} \]

\[ 3316 \quad 4600 \quad \text{No} \]

Level of Service Determination (if not F)

\[ D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 27.1 \text{ pc/mi/ln} \]

Density, \( D \)

Level of service for ramp-freeway junction areas of influence, \( C \)

Speed Estimation

Intermediate speed variable, \( M = 0.434 \)

Space mean speed in ramp influence area, \( S = 49.4 \text{ mph} \)

Space mean speed in outer lanes, \( S = 49.5 \text{ mph} \)

Space mean speed for all vehicles, \( S = 49.4 \text{ mph} \)
HCSb: Ramps and Ramp Junctions Release 5.4

Phone:
Fax:
E-mail:

Merge Analysis

Analyst: CTR
Agency/Co.: HNTB
Date performed: 07/30/2010
Analysis time period: Build
Freeway/Dir of Travel: I-4 EB
Junction: On Ramp from US 1792
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Merge
Number of lanes in freeway: 3
Free-flow speed on freeway: 70.0 mph
Volume on freeway: 5910 vph

On Ramp Data

Side of freeway: Right
Number of lanes in ramp: 1
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 650 vph
Length of first accel/decel lane: 900 ft
Length of second accel/decel lane: ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes
Volume on adjacent Ramp: 1220 vph
Position of adjacent Ramp: Upstream
Type of adjacent Ramp: Off
Distance to adjacent Ramp: 1948 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>5910</td>
<td>650</td>
<td>1220</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1555</td>
<td>171</td>
<td>321 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9 ✓</td>
<td>9</td>
<td>9 %</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Grade</td>
<td>%</td>
<td>Level</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>%</td>
<td>Level</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5 mi</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2 mi</td>
</tr>
</tbody>
</table>
Estimation of V12 Merge Areas

\[ L = 1372.02 \text{ (Equation 25-2 or 25-3)} \]
\[ P = 0.603 \text{ Using Equation 1} \]
\[ v = v \frac{(P)}{FM} = 3918 \text{ pc/h} \]

Capacity Checks

\[ v \]
\[ FO \]
\[ v = 2583 \text{ pc/h} \text{ (Equation 25-4 or 25-5)} \]
\[ v \text{ or } av34 \geq 2700 \text{ pc/h?} \]
\[ v \text{ or } av34 \geq 1.5 v /2 \]
\[ \text{If yes, } v = 3918 \text{ (Equation 25-8)} \]

Flow Entering Merge Influence Area

\[ v \]
\[ R12 \]
\[ v = 3918 \text{ pc/h} \]
\[ \text{Max Desirable} = 4600 \text{ pc/h} \]

Level of Service Determination (if not F)

\[ \text{Density, } D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 35.6 \text{ pc/ml/ln} \]
\[ R \]
\[ R = \frac{12}{12} A \]

Level of service for ramp-freeway junction areas of influence \(\n\)

Speed Estimation

Intermediate speed variable, \( M = 0.659 \)

Space mean speed in ramp influence area, \( S = 51.5 \text{ mph} \)

Space mean speed in outer lanes, \( S = 61.8 \text{ mph} \)

Space mean speed for all vehicles, \( S = 54.8 \text{ mph} \)
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: 
E-mail: 
Fax: 

Diverge Analysis

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/29/2010
Analysis time period: Build
Freeway/Dir of Travel: I-4 WB
Junction: Off Ramp to US 1792
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>70.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>6560 vph</td>
</tr>
</tbody>
</table>

Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>650 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>500 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

| Does adjacent ramp exist? | Yes |
| Volume on adjacent ramp | 1220 vph |
| Position of adjacent ramp | Downstream |
| Type of adjacent ramp | On |
| Distance to adjacent ramp | 1940 ft |

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>6560</td>
<td>650</td>
<td>1220 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Peak 15-min volume, vl5</td>
<td>1726</td>
<td>171</td>
<td>321 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9</td>
<td>9</td>
<td>9 %</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00 %</td>
<td>0.00</td>
<td>0.00 %</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, f_{HV} & 0.957 & 0.957 & 0.957 \\
Driver population factor, f_{P} & 1.00 & 1.00 & 1.00 \\
Flow rate, v_p & 7216 & 715 & 1342 pcph \\

---

**Estimation of V12 Diverge Areas**

\[
\begin{align*}
L & = \text{(Equation 25-8 or 25-9)} \\
\text{EQ} & \quad P = 0.547 \\
\text{FD} & \quad v = v + (v - v) P = 4269 \text{ pc/h} \\
12 & \quad R \quad F \quad R \quad FD
\end{align*}
\]

---

**Capacity Checks**

\[
\begin{align*}
v & = v \\
F_i & = F \\
v & = v - v \\
F_O & = F \quad R \\
v & = \quad R \\
3 & \quad \text{or} \quad \text{av}34 \\
v & = \frac{v}{3} \quad \text{or} \quad \text{av}34 \\
\text{Is} & \quad \frac{v}{3} \quad > \quad 2700 \text{ pc/h?} \\
\text{Is} & \quad \frac{v}{12} \quad > \quad 1.5 \frac{v}{2} \\
\text{If yes,} & \quad v_{12A} = 4516 \\
12A & \quad (\text{Equation 25-18})
\end{align*}
\]

---

**Flow Entering Diverge Influence Area**

\[
\begin{align*}
v & = v \\
12A & \quad \text{Actual} & \quad \text{Max Desirable} & \quad \text{Violation?} \\
4516 & \quad 4400 & \quad \text{No}
\end{align*}
\]

---

**Level of Service Determination (if not F)**

\[
\begin{align*}
\text{Density}, \quad D & = 4.252 + 0.0086 v - 0.009 L \\
R & \quad 12 \\
\text{D} & \quad 38.6 \text{ pc/mi/ln}
\end{align*}
\]

---

**Speed Estimation**

\[
\begin{align*}
\text{Intermediate speed variable}, & \quad D = 0.492 \\
S & \quad \text{mph} \\
\text{Space mean speed in ramp influence area}, & \quad S = 56.2 \text{ mph} \\
R & \quad \text{mph} \\
\text{Space mean speed in outer lanes}, & \quad S = 70.2 \text{ mph} \\
0 & \quad \text{mph} \\
\text{Space mean speed for all vehicles}, & \quad S = 60.7 \text{ mph}
\end{align*}
\]
Phone: 
Fax: 
E-mail: 

Diverge Analysis

Analyst: CTRR  
Agency/Co.: HNTB  
Date performed: 03/05/2010  
Analysis time period: Build Service Road Concept  
Freeway/Dir of Travel: I-4 EB  
Junction: Off Ramp to SR 417 & SR 46  
Jurisdiction: Seminole County  
Analysis Year: 2032  
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>4630 vph</td>
</tr>
</tbody>
</table>

Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>2070 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>406 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>1500 ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>1840 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Upstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>1906 ft</td>
</tr>
</tbody>
</table>

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway Ramp</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>4630</td>
<td>2070</td>
<td>1840</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15 1286 575 511  v
Trucks and buses 0 0 0  %
Recreational vehicles 0 0 0  %
Terrain type: Level Level Level
  Grade 0.00 % 0.00 % 0.00 %
  Length 0.00 mi 0.00 mi 0.00 mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 5144 2300 2044 pcp/h

Estimation of V12 Diverge Areas

L = \text{ (Equation 25-8 or 25-9)}
EQ
P = 0.450 \text{ Using Equation 0}
FD
v = v + (v - v) P = 3580 pc/h
12 R F R FD

Capacity Checks

\[ v = v \]
\[ Fi F \]
\[ v = v - v \]
\[ FO F R \]
\[ v \]
\[ 2300 3800 \text{ No} \]
\[ 3 \text{ or av34} \]
\[ v > 2700 \text{ pc/h?} \]
\[ 3 \text{ or av34} \]
\[ v > 1.5 v /2 \]
\[ 3 \text{ or av34} 12 \]
\[ \text{If yes, } v = 3580 \]
\[ 12A \]

Flow Entering Diverge Influence Area

\[ v = v \]
\[ 3580 4400 \text{ No} \]
\[ 12 \]

Level of Service Determination (if not F)

Density,
\[ D = 4.252 + 0.0086 v - 0.009 L = 14.2 \text{ pc/mi/ln} \]
\[ 12 D \]
Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, \[ D = 0.635 \]
Space mean speed in ramp influence area, \[ S = 46.7 \text{ mph} \]
Space mean speed in outer lanes, 0
R

S = 58.1 mph

Space mean speed for all vehicles, 0

S = 49.7 mph
**Diverge Analysis**

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/29/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** I-4 EB  
**Junction:** Off Ramp to CR 46A  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>✔</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>6450</td>
</tr>
</tbody>
</table>

### Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1840</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>0 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>1500 ft</td>
</tr>
</tbody>
</table>

---

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>2070</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>1906 ft</td>
</tr>
</tbody>
</table>

---

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>6450</td>
<td>1840</td>
<td>2070 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1753</td>
<td>500</td>
<td>562 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9</td>
<td>9</td>
<td>9 %</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00 %</td>
<td>0.00 %</td>
<td>0.00 %</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5* mi</td>
<td>1.5  mi</td>
<td>1.5 mi</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Heavy vehicle adjustment, fHV</td>
<td>0.957</td>
<td>0.957</td>
<td>0.957</td>
</tr>
<tr>
<td>Driver population factor, fP</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Flow rate, vp</td>
<td>7326</td>
<td>2090</td>
<td>2351</td>
</tr>
</tbody>
</table>

**Estimation of V12 Diverge Areas**

\[
L = \text{EQ} \\
P = 0.260 \quad \text{Using Equation 0} \\
v = v + (v - v) P = 3451 \text{ pc/h} \\
12 \quad R \quad F \quad R \quad FD
\]

**Capacity Checks**

<table>
<thead>
<tr>
<th>v = v</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fi F</td>
<td>7326</td>
<td>9000</td>
<td>No</td>
</tr>
<tr>
<td>v = v - v</td>
<td>5236</td>
<td>9000</td>
<td>No</td>
</tr>
<tr>
<td>FO F R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>2090</td>
<td>3800</td>
<td>No</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>1937 pc/h</td>
<td>(Equation 25-15 or 25-16)</td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is \( v \) > 2700 pc/h? No

Is \( v \) > 1.5 \( v \)/2 No

If yes, \( v \) = 3451 (Equation 25-18)

**Flow Entering U12 Diverge Influence Area**

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>3451</td>
<td>4400</td>
<td>No</td>
</tr>
</tbody>
</table>

**Level of Service Determination (if not F)**

\[
D = 4.252 + 0.0086 v - 0.009 \quad L = 20.4 \quad \text{pc/mi/ln} \\
12 \quad R \quad D
\]

**Density**

For ramp-freeway junction areas of influence C

**Speed Estimation**

- Intermediate speed variable, \( D = 0.616 \)
- Space mean speed in ramp influence area, \( S = 47.0 \text{ mph} \)
- Space mean speed in outer lanes, \( S = 56.7 \text{ mph} \)
- Space mean speed for all vehicles, \( S = 51.7 \text{ mph} \)
HCS+: Ramps and Ramp junctions Release 5.4

Diverge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 03/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: I-4 EB
Junction: Off Ramp to SR 417 & SR 46
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 3
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 4630 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 2
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 2070 vph
Length of first accel/decel lane: 406 ft
Length of second accel/decel lane: 1500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 810 vph
Position of adjacent ramp: Downstream
Type of adjacent ramp: On
Distance to adjacent ramp: 1410 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>4630</td>
<td>2070</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1286</td>
<td>575</td>
</tr>
<tr>
<td>------------------------</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type: Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>0.00</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Heavy vehicle adjustment, fHV</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Driver population factor, fP</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Flow rate, vp</td>
<td>5144</td>
<td>2300</td>
</tr>
</tbody>
</table>

**Estimation of V12 Diverge Areas**

\[ L = \text{ (Equation 25-8 or 25-9)} \]
\[ \text{EQ} \]
\[ P = 0.450 \text{ Using Equation 0} \]
\[ \text{FD} \]
\[ v = v + (v - v) P = 3580 \text{ pc/h} \]
\[ 12 \text{ R FR FD} \]

**Capacity Checks**

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v = v</td>
<td>5144</td>
<td>6750</td>
</tr>
<tr>
<td>Fi F</td>
<td>v = v - v</td>
<td>2844</td>
</tr>
<tr>
<td>FO FR</td>
<td>v</td>
<td>2300</td>
</tr>
<tr>
<td>R</td>
<td>v</td>
<td>1564 pc/h</td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v v &gt; 2700 pc/h?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td>Is v v &gt; 1.5 v /2</td>
<td>No</td>
</tr>
<tr>
<td>3 or av34</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>If yes, v = 3580</td>
<td>(Equation 25-18)</td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Flow Entering Diverge Influence Area**

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>3580</td>
<td>4400</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Level of Service Determination (if not F)**

\[ D = 4.252 + 0.0086 v - 0.009 L = 14.2 \text{ pc/mi/ln} \]
\[ R 12 D \]

Level of service for ramp-freeway junction areas of influence B

**Speed Estimation**

Intermediate speed variable, \( D = 0.635 \)

Space mean speed in ramp influence area, \( S = 46.7 \text{ mph} \)
<table>
<thead>
<tr>
<th>Description</th>
<th>Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space mean speed in outer lanes</td>
<td>58.1</td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Space mean speed for all vehicles</td>
<td>49.7</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: 
Fax: 
E-mail: 

---

**Merge Analysis**

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/29/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** I-4 EB  
**Junction:** On Ramp from CR 46A  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

**Freeway Data**

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>65.0</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2540</td>
</tr>
</tbody>
</table>

---

**On Ramp Data**

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>830</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>700</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

**Adjacent Ramp Data (if one exists)**

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>1450</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>4826</td>
</tr>
</tbody>
</table>

---

**Conversion to pc/h Under Base Conditions**

**Junction Components**

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>690</td>
<td>226</td>
<td>394</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, IHV 0.957 0.957 0.952
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 2885 943 1655 pcph

---

Estimation of V12 Merge Areas

\[ L = \quad \text{(Equation 25-2 or 25-3)} \]
\[ E \]
\[ P = 0.597 \quad \text{Using Equation 1} \]
\[ FM \]
\[ v = v \quad (P) = 1723 \quad \text{pc/h} \]
\[ \frac{v}{12} \quad F \quad FM \]

---

Capacity Checks

\[ v \quad 3828 \quad 6750 \]
\[ FO \]
\[ v \quad 1162 \quad \text{pc/h} \quad \text{(Equation 25-4 or 25-5)} \]
\[ 3 \quad \text{or} \quad \text{av34} \]
\[ v \]

Is \[ v \quad v \quad > 2700 \quad \text{pc/h?} \]
\[ 3 \quad \text{or} \quad \text{av34} \]

Is \[ v \quad v \quad > 1.5 \quad \frac{v}{2} \]
\[ 3 \quad \text{or} \quad \text{av34} \]
\[ 12 \]

If yes, \[ v \quad 1723 \]
\[ 12A \]

---

Flow Entering Merge Influence Area

\[ v \quad 1723 \quad 4600 \]
\[ R12 \]

---

Level of Service Determination (if not F)

Density, \[ D = 5.475 + 0.00734 \quad v + 0.0078 \quad v - 0.00627 \quad L = 21.4 \quad \text{pc/mi/ln} \]

---

Speed Estimation

Intermediate speed variable, \[ M = 0.328 \]

Space mean speed in ramp influence area, \[ S = 50.7 \quad \text{mph} \]

Space mean speed in outer lanes, \[ S = 52.6 \quad \text{mph} \]

Space mean speed for all vehicles, \[ S = 51.3 \quad \text{mph} \]
HCS+: Ramps and Ramp Juncions Release 5.4

Phone:  
Fax:  
E-mail:  

-------------------------------

**Merge Analysis**

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/29/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** I-4 EB  
**Junction:** On Ramp from CR 46A  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

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**Freeway Data**

**Type of analysis** Merge  
**Number of lanes in freeway** 3  
**Free-flow speed on freeway** 55.0 mph  
**Volume on freeway** 2540 vph

-------------------------------

**On Ramp Data**

**Side of freeway** Right  
**Number of lanes in ramp** 1  
**Free-flow speed on ramp** 35.0 mph  
**Volume on ramp** 830 vph  
**Length of first accel/decel lane** 700 ft  
**Length of second accel/decel lane** ft

-------------------------------

**Adjacent Ramp Data (if one exists):**

**Does adjacent ramp exist?** Yes  
**Volume on adjacent Ramp** 2070 vph  
**Position of adjacent Ramp** Upstream  
**Type of adjacent Ramp** Off  
**Distance to adjacent Ramp** 1410 ft

-------------------------------

**Conversion to pc/h Under Base Conditions**

**Junction Components**

<table>
<thead>
<tr>
<th></th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volume, V (vph)</strong></td>
<td>2540</td>
<td>830</td>
<td>2070 vph</td>
</tr>
<tr>
<td><strong>Peak-hour factor, PHF</strong></td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td><strong>Peak 15-min volume, v15</strong></td>
<td>690</td>
<td>226</td>
<td>562 v</td>
</tr>
<tr>
<td><strong>Trucks and buses</strong></td>
<td>9</td>
<td>9</td>
<td>9 %</td>
</tr>
<tr>
<td><strong>Recreational vehicles</strong></td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td><strong>Terrain type:</strong></td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td><strong>Grade</strong></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td><strong>Length</strong></td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td><strong>Trucks and buses PCE, ET</strong></td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Recreational vehicle PCE, ER</strong></td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV | 0.957 | 0.957 | 0.957
Driver population factor, fP | 1.00 | 1.00 | 1.00
Flow rate, vp | 2685 | 943 | 2351 pcph

--- Estimation of V12 Merge Areas ---

\[ \begin{align*}
L &= 550.19 \quad \text{(Equation 25-2 or 25-3)} \\
PE &= 0.597 \quad \text{Using Equation 1} \\
v &= \frac{P}{FM} = 1723 \quad \text{pc/h} \\
12F &= \frac{F}{FM}
\end{align*} \]

--- Capacity Checks ---

\[ \begin{align*}
v &\quad \text{Actual} & \quad \text{Maximum} & \quad \text{LOS F?} \\
\text{FO} & 3828 & 6750 & \text{No} \\
v_{3 \text{ or } av34} & 1162 \quad \text{pc/h} & \quad \text{(Equation 25-4 or 25-5)} \\
\text{Is } v_{3 \text{ or } av34} & > 2700 \quad \text{pc/h?} & \quad \text{No} \\
\text{Is } v_{3 \text{ or } av34} & > 1.5 \frac{v}{2} & \quad \text{No} \\
\text{If yes, } v_{12A} & = 1723 & \quad \text{(Equation 25-8)}
\end{align*} \]

--- Flow Entering Merge Influence Area ---

\[ \begin{align*}
v &\quad \text{Actual} & \quad \text{Max Desirable} & \quad \text{Violation?} \\
R_{12} & 1723 & 4600 & \text{No}
\end{align*} \]

--- Level of Service Determination (if not F) ---

\[ \begin{align*}
\text{Density, } D &= 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 21.4 \quad \text{pc/} \text{mi/ln} \\
R &= \frac{R}{12}A
\end{align*} \]

Level of service for ramp-freeway junction areas of influence C √

--- Speed Estimation ---

Intermediate speed variable, \( M = 0.328 \)
Space mean speed in ramp influence area, \( S = 50.7 \) mph
Space mean speed in outer lanes, \( S = 52.6 \) mph
Space mean speed for all vehicles, \( S = 51.3 \) mph
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: 
Fax: 
E-mail: 

--- Merge Analysis ---

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/29/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: I-4 EB
Junction: On Ramp from SR 27 EB
Jurisdiction: Seminole County
Analysis Year: 2012
Description: Wekiva Parkway Project Development & Environment Study

--- Freeway Data ---

Type of analysis: Merge
Number of lanes in freeway: 3
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 4820 vph

--- On Ramp Data ---

Side of freeway: Right
Number of lanes in ramp: 1
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 940 vph
Length of first accel/decel lane: 900 ft
Length of second accel/decel lane: ft

--- Adjacent Ramp Data (if one exists) ---

Does adjacent ramp exist? Yes
Volume on adjacent Ramp: 1370 vph
Position of adjacent Ramp: Downstream
Type of adjacent Ramp: On
Distance to adjacent Ramp: 3172 ft

--- Conversion to pc/h Under Base Conditions ---

Junction Components

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>4820</td>
<td>940</td>
<td>1370</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1300</td>
<td>255</td>
<td>372</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9%</td>
<td>9%</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0%</td>
<td>0%</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type: Grade</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Length</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5 mi</td>
<td>1.5 mi</td>
<td>1.5 mi</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2 mi</td>
<td>1.2 mi</td>
<td>1.2 mi</td>
</tr>
</tbody>
</table>
## Estimation of V12 Merge Areas

\[ L = \text{(Equation 25-2 or 25-3)} \]
\[ P = 0.603 \quad \text{Using Equation 1} \]
\[ v = \frac{v}{12F} = 3300 \quad \text{pc/h} \]

## Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>6543</td>
<td>6750</td>
<td>No</td>
</tr>
</tbody>
</table>

\[ v \quad \text{or} \quad av34 \]
\[ 2175 \quad \text{pc/h} \quad \text{(Equation 25-4 or 25-5)} \]

Is \[ \frac{v}{v} > 2700 \quad \text{pc/h?} \quad \text{No} \]

Is \[ \frac{v}{v} > 1.5 \frac{v}{12} \quad \text{No} \]

If yes, \[ v = 3300 \quad \text{(Equation 25-8)} \]

## Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3300</td>
<td>4600</td>
<td>No</td>
</tr>
</tbody>
</table>

## Level of Service Determination (if not F)

\[ D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 33.4 \quad \text{pc/mi/ln} \]

Level of service for ramp-freeway junction areas of influence \[ D \checkmark \]

## Speed Estimation

\[ M = 0.566 \]
\[ S = 47.6 \quad \text{mph} \]
\[ S = 49.0 \quad \text{mph} \]
\[ S = 48.1 \quad \text{mph} \]
**HCS+: Ramps and Ramp Junctions Release 5.4**

**Phone:**
**Fax:**
**E-mail:**

---

**Merge Analysis**

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/29/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** I-4 EB  
**Junction:** On Ramp from SR 417 WB  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3 ✓</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 ✓</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>3370</td>
</tr>
</tbody>
</table>

---

### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 ✓</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1450 ✓</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>900</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>1500</td>
</tr>
</tbody>
</table>

---

### Adjacent Ramp Data (if one exists)

| Does adjacent ramp exist? | Yes |
| Volume on adjacent Ramp | 830 ✓ | vph |
| Position of adjacent Ramp | Upstream ✓ |
| Type of adjacent Ramp | On |
| Distance to adjacent Ramp | 4826 | ft |

---

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>3370</td>
<td>1450</td>
<td>830 ✓ vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92 ✓</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>916 ✓</td>
<td>394</td>
<td>226 ✓</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9 ✓</td>
<td>10</td>
<td>9 ✓ 9%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0 ✓</td>
<td>0</td>
<td>0 ✓ 0%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length mi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Estimation of V12 Merge Areas

\[ L = \text{(Equation 25-2 or 25-3)} \]
\[ P = 0.555 \quad \text{Using Equation 0} \]
\[ v = v \left(\frac{P}{F} \right) = 2125 \quad \text{pc/h} \]
\[ 12 \quad F \quad \text{FM} \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>5483</td>
<td>6750</td>
</tr>
<tr>
<td>v FO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v 3 or av34</td>
<td>1703 pc/h</td>
<td>(Equation 25-4 or 25-5)</td>
</tr>
<tr>
<td>Is v v &gt; 2700 pc/h?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Is v v &gt; 1.5 v /2 3 or av34</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>If yes, v 12A = 2187</td>
<td>(Equation 25-8)</td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v 12A</td>
<td>2187</td>
<td>4600</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, \( D = 5.475 + 0.00734 \frac{v}{R} + 0.0078 \frac{v}{R} - 0.00627 \frac{L}{A} \)
\[ \text{pc/mi/ln} \]
\[ R \quad 12 \quad A \]
Level of service for ramp-freeway junction areas of influence \( B \)

Speed Estimation

Intermediate speed variable, \( M = 0.272 \)
Space mean speed in ramp influence area, \( S = 51.5 \) mph
Space mean speed in outer lanes, \( S = 50.9 \) mph
Space mean speed for all vehicles, \( S = 51.3 \) mph
Phone:  
Fax:  
E-mail:  

Merge Analysis

Analyst: CTR  
Agency/Co.: HNTB  
Date performed: 7/29/2010  
Analysis time period: Build Service Road Concept  
Freeway/Dir of Travel: I-4 EB  
Junction: On Ramp from SR 417 WB  
Jurisdiction: Seminole County  
Analysis Year: 2032  
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Merge  
Number of lanes in freeway: 3  
Free-flow speed on freeway: 55.0 mph  
Volume on freeway: 3370 vph

On Ramp Data

Side of freeway: Right  
Number of lanes in ramp: 2  
Free-flow speed on ramp: 35.0 mph  
Volume on ramp: 1450 vph  
Length of first accel/decel lane: 900 ft  
Length of second accel/decel lane: 1500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes  
Volume on adjacent Ramp: 940 vph  
Position of adjacent Ramp: Downstream  
Type of adjacent Ramp: On  
Distance to adjacent Ramp: 1976 ft

Conversion to pc/h Under Base Conditions

Junction Components  

<table>
<thead>
<tr>
<th></th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>3370</td>
<td>1450</td>
<td>940</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, vl5</td>
<td>916</td>
<td>394</td>
<td>255</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
### Heavy vehicle adjustment, fHV

<table>
<thead>
<tr>
<th></th>
<th>0.957</th>
<th>0.952</th>
<th>0.957</th>
</tr>
</thead>
</table>
### Driver population factor, fP

<table>
<thead>
<tr>
<th></th>
<th>1.00</th>
<th>1.00</th>
<th>1.00</th>
</tr>
</thead>
</table>
### Flow rate, vp

|       | 3828  | 1655  | 1068  | pcph |

---

#### Estimation of V12 Merge Areas

\[
L = \frac{P}{EQ} = 0.555 \quad \text{(Equation 25-2 or 25-3)}
\]

\[
p = \frac{v}{v} \quad \text{(P,F)} = 2125 \quad \text{pc/h}
\]

---

#### Capacity Checks

\[
v = 5483 \quad \text{pc/h} \quad \text{FO}
\]

\[
v = 1703 \quad \text{pc/h} \quad \text{(Equation 25-4 or 25-5)}
\]

Is \( \frac{v}{v} > 2700 \quad \text{pc/h?} \) \n
No

Is \( \frac{v}{v} > \frac{1.5 v}{2} \quad \text{12} \) \n
Yes

If yes, \( v = 2187 \quad \text{pc/h} \quad \text{12A} \)

---

#### Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th></th>
<th>2187</th>
<th>4600</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

#### Level of Service Determination (if not R)

\[
D = 5.475 + 0.00734 \frac{v}{R} + 0.0078 \frac{v}{R} - 0.00627 \frac{L}{A} = 14.0 \quad \text{pc/mi/ln}
\]

Level of service for ramp-freeway junction areas of influence \( B \checkmark \)

---

#### Speed Estimation

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate speed variable, ( M = 0.272 )</td>
<td></td>
</tr>
<tr>
<td>Space mean speed in ramp influence area, ( S = 51.5 \quad \text{mph} )</td>
<td></td>
</tr>
<tr>
<td>Space mean speed in outer lanes, ( S = 50.9 \quad \text{mph} )</td>
<td></td>
</tr>
<tr>
<td>Space mean speed for all vehicles, ( S = 51.3 \quad \text{mph} )</td>
<td></td>
</tr>
</tbody>
</table>
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: 
Fax: 
E-mail: 

-- Merge Analysis --

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/29/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: I-4 EB
Junction: On Ramp from SR 417 EB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

--- Freeway Data ---

Type of analysis
Number of lanes in freeway
Free-flow speed on freeway
Volume on freeway

--- Merge Data ---

Merge
Number of lanes in merge
Free-flow speed on merge
Volume on merge

--- On Ramp Data ---

Side of freeway
Number of lanes on ramp
Free-flow speed on ramp
Volume on ramp
Length of first accel/decel lane
Length of second accel/decel lane

--- Adjacent Ramp Data (if one exists) ---

Does adjacent ramp exist? Yes
Volume on adjacent ramp
Position of adjacent ramp
Type of adjacent ramp
Distance to adjacent ramp

--- Conversion to pc/h Under Base Conditions ---

Junction Components
Volume, V (vph)
Peak-hour factor, PHF
Peak 15-min volume, v15
Trucks and buses
Recreational vehicles
Terrain type:
Grade
Length
Trucks and buses PCE, ET
Recreational vehicle PCE, ER

Freeway 
Ramp 
Adjacent Ramp 
vph 
vph 
vph

% 
% 
% 
% 
mi 
mi 
mi
Heavy vehicle adjustment, $f_{HV}$ 0.957 0.957 0.957
Driver population factor, $f_P$ 1.00 1.00 1.00
Flow rate, $v_p$ 5475 1068 1647 pcph

Estimation of V12 Merge Areas

\[ L = \quad \text{(Equation 25-2 or 25-3)} \]
\[ P = \quad 0.603 \quad \text{Using Equation 1} \]
\[ v = v \left(\frac{P}{F}\right) = 3300 \quad \text{pc/h} \]
\[ \frac{12}{F} \quad \text{FM} \]

Capacity Checks

<table>
<thead>
<tr>
<th>$v$</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>6543</td>
<td>6750</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

\[ v_3 \quad \text{or} \quad av_{34} \]
\[ \frac{2175}{pc/h} \quad \text{(Equation 25-4 or 25-5)} \]

Is $v_3 \quad v_{av_{34}} > 2700 \quad pc/h$? No

Is $v_3 \quad v_{av_{34}} > 1.5 \frac{v_3}{2}$? No

If yes, $v_3 \quad = 3300 \quad \text{(Equation 25-8)}$ 12A

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>$v$</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3300</td>
<td>4600</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 \quad v + 0.0078 \quad v - 0.00627 \quad L = 33.4 \quad \text{pc/mi/ln}$

Ramp \[ R \quad \frac{12}{A} \quad \text{pc/mi/ln} \]
Level of service for ramp-freeway junction areas of influence $D \checkmark$

Speed Estimation

Intermediate speed variable, \[ M = 0.566 \quad S \]

Space mean speed in ramp influence area, \[ S = 47.6 \quad \text{mph} \]

Space mean speed in outer lanes, \[ S = 49.0 \quad \text{mph} \]

Space mean speed for all vehicles, \[ S = 48.1 \quad \text{mph} \]
HCS+: Ramps and Ramp Junctions Release 5.4

---

**Phone:**

**Fax:**

**E-mail:**

---

**Merge Analysis**

**Analyst:** CTRR  
**Agency/Co.:** HNTB  
**Date performed:** 3/05/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** I-4 EB  
**Junction:** On Ramp from SR 417 EB  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

**Freeway Data**

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>4</td>
</tr>
<tr>
<td>Free flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>4820 vph</td>
</tr>
</tbody>
</table>

---

**On Ramp Data**

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>940 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>500 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

**Adjacent Ramp Data (if one exists)**

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>1370 vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>3172 ft</td>
</tr>
</tbody>
</table>

---

**Conversion to pc/h Under Base Conditions**

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, $V$ (vph)</td>
<td>4820</td>
<td>940</td>
<td>1370</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>

---
Peak 15-min volume, \( v_{15} \) 1339 261 381
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
Grade % % %
Length mi mi mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, \( f_{HV} \) 1.000 1.000 1.000
Driver population factor, \( f_{P} \) 1.00 1.00 1.00
Flow rate, \( v_p \) 5356 1044 1522 pcp/h

Estimation of V12 Merge Areas

\[
L = (Equation 25-2 \text{ or } 25-3)
\]

\[
EQ
\]

\[
P = 0.087 \quad \text{Using Equation } 4
\]

\[
FM
\]

\[
v = v (P) = 468 \quad \text{pc/h}
\]

\[
12 \quad F \quad FM
\]

Capacity Checks

\[
<table>
<thead>
<tr>
<th>v</th>
<th>6400</th>
</tr>
</thead>
<tbody>
<tr>
<td>FO</td>
<td>Maximum LOS F?</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>v</td>
<td>9000</td>
</tr>
</tbody>
</table>

\[
v = v (3 \text{ or } av34) = 2444 \quad \text{pc/h} \quad (Equation 25-4 \text{ or } 25-5)
\]

\[
3 \text{ or } av34
\]

\[
| v | > 2700 \quad \text{pc/h}? |
|---|---|---|
| 3 \text{ or } av34 | No |

\[
| v | > 1.5 \quad v_{/2} |
|---|---|---|
| 3 \text{ or } av34 |

\[
| L_{2A} |
\]

\[
If \text{ yes, } v = 2142 \quad (Equation 25-8)
\]

Flow Entering Merge Influence Area

\[
<table>
<thead>
<tr>
<th>v</th>
<th>2142</th>
</tr>
</thead>
<tbody>
<tr>
<td>I2A</td>
<td></td>
</tr>
</tbody>
</table>

| Max Desirable Violation? |
|---|---|---|
| 4600 | No |

Level of Service Determination (if not F)

\[
Density, D = 5.475 + 0.00734 \quad v + 0.0078 \quad v - 0.00627 \quad L = 26.7 \quad \text{pc/mi/in}
\]

\[
R \quad R \quad 12 \quad A
\]

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

\[
Intermediate \quad speed \quad variable, \quad M = 0.380
\]

\[
Space \quad mean \quad speed \quad in \quad ramp \quad influence \quad area, \quad S = 50.1 \quad \text{mph}
\]

\[
Space \quad mean \quad speed \quad in \quad outer \quad lanes, \quad S = 51.0 \quad \text{mph}
\]

\[
Space \quad mean \quad speed \quad for \quad all \quad vehicles, \quad S = 50.5 \quad \text{mph}
\]
HCS+: Ramps and Ramp Junctions Release 5.4

Phone:    Fax:    E-mail:

Merge Analysis

Analyst:   CTRR
Agency/Co.:  HNTB
Date performed:  3/05/2010
Analysis time period:  Build Service Road Concept
Freeway/Dir of Travel:  I-4 EB
Junction:   On Ramp from SR 46
Jurisdiction:  Seminole County
Analysis Year:  2032
Description:  Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Merge
Number of lanes in freeway: 4
Free flow speed on freeway: 55.0 mph
Volume on freeway: 5760 vph

On Ramp Data

Side of freeway: Right
Number of lanes in ramp: 2
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 1370 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: 500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes
Volume on adjacent Ramp: 940 vph
Position of adjacent Ramp: Upstream
Type of adjacent Ramp: On
Distance to adjacent Ramp: 3172 ft

Conversion to pc/h Under Base Conditions

Junction Components  Freeway Ramp  Adjacent Ramp
Volume, V (vph)    5760  1370  940 vph
Peak-hour factor, PHF  0.90  0.90  0.90
Peak 15-min volume, v15  1600  381  261  v
Trucks and buses 0  0  0  %
Recreational vehicles 0  0  0  %
Terrain type:  Level  Level  Level
   Grade  %  %  %
   Length  mi  mi  mi
Trucks and buses PCE, ET  1.5  1.5  1.5
Recreational vehicle PCE, ER  1.2  1.2  1.2
Heavy vehicle adjustment, fHV  1.000  1.000  1.000
Driver population factor, fP  1.00  1.00  1.00
Flow rate, vP  6400  1522  1044  pcp/h

Estimation of V12 Merge Areas

\[ L = \text{(Equation 25-2 or 25-3)} \]

\[ P = 0.209 \] Using Equation 0

\[ F_M \]

\[ v = v (P) = 1338 \] pcp/h

\[ 12 \] F FM

Capacity Checks

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>7922</td>
<td>9000</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>FO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2531 pc/h</td>
<td>(Equation 25-4 or 25-5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v v &gt; 2700 pc/h?</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v v &gt; 1.5 v /2</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 or av34 12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, v = 2560</td>
<td>(Equation 25-8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2560</td>
<td>4600</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 27.2 pc/mi/ln

R 12 A

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, \[ M = 0.447 \]

Space mean speed in ramp influence area, \[ S = 49.2 \] mph

Space mean speed in outer lanes, \[ S = 49.9 \] mph

Space mean speed for all vehicles, \[ S = 49.5 \] mph
Diverge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 3/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: 1-4 WB
Junction: Off Ramp to SR 46
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis Diverge
Number of lanes in freeway 4
Free-flow speed on freeway 55.0 mph
Volume on freeway 6600 vph

Off Ramp Data

Side of freeway Right
Number of lanes in ramp 2
Free-Flow speed on ramp 35.0 mph
Volume on ramp 1370 vph
Length of first accel/decel lane 0 ft
Length of second accel/decel lane 500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes
Volume on adjacent ramp 3210 vph
Position of adjacent ramp Downstream
Type of adjacent ramp Off
Distance to adjacent ramp 6098 ft

Conversion to pc/h Under Base Conditions

Junction Components Freeway Ramp Adjacent
Volume, V (vph) 6600 1370 3210 vph
Peak-hour factor, PHF 0.90 0.90 0.90
Peak 15-min volume, v15  1833  381  892  v
Trucks and buses  0  0  0  %
Recreational vehicles  0  0  0  %
Terrain type:  Level  Level  Level
   Grade  0.00  %  0.00  %  0.00  %
   Length  0.00  mi  0.00  mi  0.00  mi
Trucks and buses PCE, ET  1.5  1.5  1.5
Recreational vehicle PCE, ER  1.2  1.2  1.2
Heavy vehicle adjustment, fHV  1.000  1.000  1.000
Driver population factor, fP  1.00  1.00  1.00
Flow rate, vp  7333  1522  3567  pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.260 Using Equation 0
FD
v = v + (v - v) P = 3033 pc/h
12 R  F  R  FD

Capacity Checks

\[
\begin{array}{ccc}
\text{Actual} & \text{Maximum} & \text{LOS F?} \\
v = v & 7333 & 9000 \\
F & F \\
v = v - v & 5811 & 9000 \\
F & F & R \\
v = 1522 & 3800 & No \\
R \\
v = v & 2150 pc/h (Equation 25-15 or 25-16) \\
3 or av34 \\
Is v > 2700 pc/h? & No \\
3 or av34 \\
Is v > 1.5 v /2 & No \\
3 or av34 & 12 \\
If yes, v = 3033 & (Equation 25-18) \\
12A \\
\end{array}
\]

Flow Entering Diverge Influence Area

\[
\begin{array}{ccc}
\text{Actual} & \text{Max Desirable} & \text{Violation?} \\
v = 3033 & 4400 & No \\
12 \\
\end{array}
\]

Level of Service Determination (if not F)

Density, \[ D = 4.252 + 0.0086 v - 0.009 \]
\[ L = 25.8 \text{ pc/mi/ln} \]
R 12  D

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, \[ D = 0.565 \]
Space mean speed in ramp influence area, \[ S = 47.7 \text{ mph} \]
R
Space mean speed in outer lanes,
0  S = 55.8  mph
Space mean speed for all vehicles,
S = 52.1  mph
HCS+: Ramps and Ramp Junctions Release 5.4

Diverge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 3/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: I-4 WB
Junction: Off Ramp to SR 417 & CR 46A
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 4
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 5230 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 2
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 3210 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: 500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes
Volume on adjacent ramp: 1370 vph
Position of adjacent ramp: Upstream
Type of adjacent ramp: Off
Distance to adjacent ramp: 6098 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>5230</td>
<td>3210</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15 1453 892 381 v
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terain type: Level Level Level
Grade 0.00 % 0.00 % 0.00 %
Length 0.00 mi 0.00 mi 0.00 mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 5811 3567 1522 pcph

Estimation of V12 Diverge Areas

L = \text{(Equation 25-8 or 25-9)}
EQ
P = 0.260 Using Equation 0
FD
v = v + (v - v) P = 4150 pc/h
12 R F R FD

Capacity Checks

 Actual Maximum LOS F?
 v = v 5811 9000 No
 Fi F
 v = v - v 2244 9000 No
 FO F R
 v 3567 3800 No
 R
 v = \text{(Equation 25-15 or 25-16)}
3 or av34
 v > 2700 pc/h? No
3 or av34
Is v v > 1.5 v /2 No
3 or av34 12
If yes, v = 4150 (Equation 25-18)
12A

Flow Entering Diverge Influence Area

 Actual Max Desirable Violation?
 v 4150 4400 No
12

Level of Service Determination (if not F)

Density,
\[ D = 4.252 + 0.0086 v - 0.009 \]
\[ L = 26.4 \text{ pc/mi/in} \]
R 12 D
Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,
\[ D = 0.749 \]
\[ S \]
Space mean speed in ramp influence area, \[ S = 45.3 \text{ mph} \]
Space mean speed in outer lanes, $S = 60.3$ mph
Space mean speed for all vehicles, $S = 48.7$ mph
**Diverge Analysis**

**Analyst:** CTRR  
**Agency/Co.:** HNTB  
**Date performed:** 3/05/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** I-4 WB  
**Junction:** Off Ramp to SR 417 & CR 46A  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>4</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>5230 vph</td>
</tr>
</tbody>
</table>

### Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>3210 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>500 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>500 ft</td>
</tr>
</tbody>
</table>

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>730 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>3490 ft</td>
</tr>
</tbody>
</table>

---

**Conversion to pc/h Under Base Conditions**

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>5230</td>
<td>3210</td>
<td>730</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15  1453  892  203  v
Trucks and buses  0  0  0  %
Recreational vehicles  0  0  0  %
Terrain type:  Level  Level  Level
Grade  0.00  %  0.00  %  0.00  %
Length  0.00  mi  0.00  mi  0.00  mi
Trucks and buses PCE, ET  1.5  1.5  1.5
Recreational vehicle PCE, ER  1.2  1.2  1.2
Heavy vehicle adjustment, fHV  1.000  1.000  1.000
Driver population factor, fP  1.00  1.00  1.00
Flow rate, vp  5811  3567  811  peph

Estimation of V12 Diverge Areas

\[ L = \text{(Equation 25-8 or 25-9)} \]
\[ P = 0.260 \text{ Using Equation 0} \]

\[ v = v + (v - v) P = 4150 \text{ pc/h} \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fi  F</td>
<td>9000</td>
<td>No</td>
</tr>
<tr>
<td>v = v</td>
<td>5811</td>
<td></td>
</tr>
<tr>
<td>Fi  F</td>
<td>9000</td>
<td>No</td>
</tr>
<tr>
<td>v = v</td>
<td>2244</td>
<td></td>
</tr>
<tr>
<td>FO  F</td>
<td>9000</td>
<td></td>
</tr>
<tr>
<td>v = v</td>
<td>3567</td>
<td></td>
</tr>
<tr>
<td>FO  F</td>
<td>3800</td>
<td>No</td>
</tr>
<tr>
<td>v = v</td>
<td>830pc/h</td>
<td></td>
</tr>
<tr>
<td>R 3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v = v</td>
<td>830pc/h</td>
<td>(Equation 25-15 or 25-16)</td>
</tr>
<tr>
<td>R 3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v = v</td>
<td>9000</td>
<td>No</td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v = v</td>
<td>2700</td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v = v</td>
<td>1.5v/2</td>
<td>No</td>
</tr>
</tbody>
</table>

If yes, \[ v = 4150 \text{ pc/h} \]

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v = v</td>
<td>4150</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>4400</td>
<td></td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

\[ D = 4.252 + 0.0086 v - 0.009 \text{ L} = 26.4 \text{ pc/mi/ln} \]

\[ R = 12 D \]

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, \[ D = 0.749 \]

Space mean speed in ramp influence area, \[ S = 45.3 \text{ mph} \]
R

Space mean speed in outer lanes, \( 0 \)  \( S = 60.3 \) mph

Space mean speed for all vehicles, \( S = 48.7 \) mph
**Merge Analysis**

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/29/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** I-4 WB  
**Junction:** On Ramp from SR 417  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2540</td>
</tr>
</tbody>
</table>

### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>730</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>600</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>1500</td>
</tr>
</tbody>
</table>

### Adjacent Ramp Data (if one exists:)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>3180</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>3654</td>
</tr>
</tbody>
</table>

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2540</td>
<td>730</td>
<td>3180</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>690</td>
<td>198</td>
<td>864</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, FHV
Driver population factor, FP
Flow rate, vp

<table>
<thead>
<tr>
<th></th>
<th>0.957</th>
<th>0.957</th>
<th>0.957</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>2885</td>
<td>829</td>
<td>3012</td>
</tr>
</tbody>
</table>

pcph

---

Estimation of V12 Merge Areas

\[
L = \frac{P}{\text{EQ}} \quad (\text{Equation 25-2 or 25-3}) \]

\[
P = 0.555 \quad \text{Using Equation 0} \]

\[
v = \frac{v}{(P)} = 1601 \text{ pc/h} \]

\[
12 \quad F \quad \text{FM} \]

---

Capacity Checks

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>3714</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>FO</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
v = \frac{v}{3 or av34} = 1284 \text{ pc/h} \quad (\text{Equation 25-4 or 25-5}) \]

Is \[v > 2700 \text{ pc/h?} \quad \text{No}\]

Is \[\frac{v}{3 or av34} > 1.5 \frac{v}{12} \quad \text{Yes}\]

If yes, \[v = 1648 \quad \text{(Equation 25-8)}\]

---

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Max</th>
<th>Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>1648</td>
<td>4600</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

12A

---

Level of Service Determination (if not F)

\[
\text{Density, } D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 \frac{L}{R} = 7.5 \quad \text{pc/mi/ln} \]

\[
\frac{R}{12} \quad \frac{A}{A} \quad \sqrt{A} \]

Level of service for ramp-freeway junction areas of influence A

---

Speed Estimation

Intermediate speed variable, \[M = 0.178\]

Space mean speed in ramp influence area, \[S = 52.7 \quad \text{nph}\]

Space mean speed in outer lanes, \[S = 52.3 \quad \text{nph}\]

Space mean speed for all vehicles, \[S = 52.6 \quad \text{mph}\]
### Merge Analysis

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/29/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** I-4 WB  
**Junction:** On Ramp from SR 417  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

#### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3 ✓</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2540 vph</td>
</tr>
</tbody>
</table>

#### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>730 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>600 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>1500 ft</td>
</tr>
</tbody>
</table>

#### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>3220 ✓ vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Upstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>3490 ft</td>
</tr>
</tbody>
</table>

#### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2540 ✓</td>
<td>730</td>
<td>3220 ✓ vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92 ✓</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>690 ✓</td>
<td>198</td>
<td>875 v</td>
</tr>
</tbody>
</table>
| Trucks and buses    | 9 ✓     | 9    | 9             |%
| Recreational vehicles | 0 ✓    | 0    | 0             |%
| Terrain type:       | Level | Level | Level      |
| Grade               | %     | %     | %           |
| Length              | mi    | mi    | mi          |
| Trucks and buses PCE, ET | 1.5 ✓ | 1.5 | 1.5 |
| Recreational vehicle PCE, ER | 1.2 ✓ | 1.2 | 1.2 |
Heavy vehicle adjustment, f_{HV} & 0.957 & 0.957 & 0.957 \\
Driver population factor, f_p & 1.00 & 1.00 & 1.00 \\
Flow rate, v_p & 2885 & 829 & 3657 \text{ pc/h} \\

Estimation of V12 Merge Areas

\[ L = \text{EQ} \]

\[ P = 0.555 \text{ Using Equation 0} \]

\[ v = v \left( \frac{P}{F_{FM}} \right) = 1601 \text{ pc/h} \]

Capacity Checks

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>3714</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>FO</td>
<td>v</td>
<td>1284 pc/h (Equation 25-4 or 25-5)</td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td>v</td>
<td>&gt; 2700 pc/h? No</td>
<td></td>
</tr>
<tr>
<td>Is</td>
<td>v</td>
<td>&gt; 1.5 ( \frac{v}{2} ) Yes</td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td>v</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>If yes, ( v ) &amp; = 1648 (Equation 25-8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>12A</td>
<td>1648</td>
<td>4600</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

\[ \text{Density, } D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 \frac{L}{R} = 7.5 \text{ pc/mi/ln} \]

Level of service for ramp-freeway junction areas of influence A \( \sqrt{A} \)

Speed Estimation

<table>
<thead>
<tr>
<th>Intermediate speed variable,</th>
<th>( M = 0.178 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space mean speed in ramp influence area, ( S )</td>
<td>( S = 52.7 \text{ mph} )</td>
</tr>
<tr>
<td>Space mean speed in outer lanes, ( S )</td>
<td>( S = 52.3 \text{ mph} )</td>
</tr>
<tr>
<td>Space mean speed for all vehicles, ( S )</td>
<td>( S = 52.6 \text{ mph} )</td>
</tr>
</tbody>
</table>
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: Fax:
E-mail:

---------- Merge Analysis ----------

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 3/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: I-4 WB
Junction: On Ramp from SR 46 & CR 46A
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

---------- Freeway Data ----------

Type of analysis: Merge
Number of lanes in freeway: 3
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 2750 vph

---------- On Ramp Data ----------

Side of freeway: Right
Number of lanes in ramp: 2
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 3170 vph
Length of first accel/decel lane: 900 ft
Length of second accel/decel lane: 900 ft

---------- Adjacent Ramp Data (if one exists) ----------

Does adjacent ramp exist?: Yes
Volume on adjacent Ramp: 730 vph
Position of adjacent Ramp: Upstream
Type of adjacent Ramp: On
Distance to adjacent Ramp: 3654 ft

---------- Conversion to pc/h Under Base Conditions ----------

Junction Components
Volume, V (vph) Freeway Ramp Adjacent Ramp
2750 3170 730 vph
Peak-hour factor, PHF 0.90 0.90 0.90
Peak 15-min volume, v15 764 881 203 v
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
Grade % % %
Length mi mi mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 3056 3522 811 pcph

Estimation of V12 Merge Areas

\[ L = \text{EQ} \]
\[ P = 0.555 \text{ Using Equation 0} \]
\[ v = v (P) = 1696 \text{ pc/h} \]
\[ 12 \text{ F FM} \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>v</td>
<td>6578</td>
</tr>
<tr>
<td>FO</td>
<td>v</td>
<td>1360 pc/h (Equation 25-4 or 25-5)</td>
</tr>
<tr>
<td>3 or av34</td>
<td>v</td>
<td>2700 pc/h?</td>
</tr>
<tr>
<td>3 or av34</td>
<td>v</td>
<td>1.5v /2</td>
</tr>
<tr>
<td>3 or av34</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>If yes, v = 1746</td>
<td>(Equation 25-8)</td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>v</td>
<td>1746</td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

\[ D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 28.0+ \text{ pc/mi/ln} \]
\[ R \quad R \quad 12 \quad A \]

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 28.0+ pc/mi/ln
\[ R \quad R \quad 12 \quad A \]

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, \( M = 0.889 \)
Space mean speed in ramp influence area, \( S = 43.4 \text{ mph} \)
Space mean speed in outer lanes, \( S = 52.1 \text{ mph} \)
Space mean speed for all vehicles, \( S = 44.9 \text{ mph} \)
Operational Analysis

Analyst: CTR
Agency or Company: HNTB
Date Performed: 8/10/2010
Analysis Time Period: Build
Freeway/Direction: I-4 WB
From/To: On Ramp from CR 46A & SR 46
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway PD&E

Flow Inputs and Adjustments

Volume, V | 6450 | veh/h
Peak-hour factor, PHF | 0.92 |
Peak 15-min volume, v15 | 1753 | veh
Trucks and buses | 9 | %
Recreational vehicles | 0 | %
Terrain type: Level
Grade | 0.00 | %
Segment length | 0.00 | mi
Trucks and buses PCE, ET | 1.5 |
Recreational vehicle PCE, ER | 1.2 |
Heavy vehicle adjustment, fHV | 0.957 |
Driver population factor, fp | 1.00 |
Flow rate, vp | 1832 | pc/h/ln

Speed Inputs and Adjustments

Lane width | 12.0 | ft
Right-shoulder lateral clearance | 6.0 | ft
Interchange density | 0.90 | interchange/mi
Number of lanes, N | 4 |
Free-flow speed: Base
FFS or BFFS | 70.0 | mi/h
Lane width adjustment, flw | 0.0 | mi/h
Lateral clearance adjustment, fLC | 0.0 | mi/h
Interchange density adjustment, fID | 2.0 | mi/h
Number of lanes adjustment, fn | 1.5 | mi/h
Free-flow speed, FFS Urban Freeway | 66.5 | mi/h

LOS and Performance Measures

Flow rate, vp | 1832 | pc/h/ln
Free-flow speed, FFS | 66.5 | mi/h
Average passenger-car speed, s | 64.8 | mi/h
Number of lanes, N | 4 |
Density, D | 28.3 | pc/mi/ln
Level of service, LOS D
Overall results are not computed when free-flow speed is less than 55 mph.
**Merge Analysis**

**Analyst:** CTR  
**Agency/Co.:** HMTB  
**Date performed:** 7/29/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** CD Rd (West of I-4) WB  
**Junction:** On Ramp from CR 46A to CD Rd  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 / mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>1340 / vph</td>
</tr>
</tbody>
</table>

### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 / mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1840 / vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>600 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>900 / vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Upstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>1320 ft</td>
</tr>
</tbody>
</table>

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>1340</td>
<td>1840</td>
<td>900</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92 ✓</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>364 ✓</td>
<td>500</td>
<td>245</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9 ✓</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level %</td>
<td>Level %</td>
<td>Level %</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Estimation of V12 Merge Areas

\[ \begin{align*}
L &= \quad \text{(Equation 25-2 or 25-3)} \\
\text{EQ} &
\end{align*} \]

\[ \begin{align*}
P &= 1.000 \quad \text{Using Equation 0} \\
\text{FM} &
\end{align*} \]

\[ \begin{align*}
v &= v \left( \frac{P}{FM} \right) = 1522 \quad \text{pc/h} \\
12 & \quad F \quad \text{FM}
\end{align*} \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3612</td>
<td>4500</td>
<td>No</td>
</tr>
</tbody>
</table>

\[ \begin{align*}
v &= \text{FO} \\
v &= v \left( \frac{3}{3 \text{ or } \text{av34}} \right) = 0 \quad \text{pc/h} \\
\text{(Equation 25-4 or 25-5)}
\end{align*} \]

\[ \begin{align*}
\text{Is } v &= v \left( \frac{v}{2} \right) > 2700 \quad \text{pc/h?} \\
\text{Is } v &= v \left( \frac{1.5 \text{ or } \text{av34}}{12} \right) > 1.5 \quad \text{No}
\end{align*} \]

\[ \begin{align*}
\text{If yes, } v &= 1522 \quad \text{pc/h} \\
12A &
\end{align*} \]

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1522</td>
<td>4600</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

\[ \begin{align*}
\text{Density, } D &= 5.475 + 0.00734 \text{ v } + 0.0078 \text{ v } - 0.00627 \text{ L } = 28.9 \quad \text{pc/mi/ln} \\
\text{R} & \quad \text{R} \quad 12 & \quad \text{A}
\end{align*} \]

Level of service for ramp-freeway junction areas of influence \( \checkmark \)

Speed Estimation

\[ \begin{align*}
\text{Intermediate speed variable, } M &= 0.423 \\
\text{Space mean speed in ramp influence area, } S &= 49.5 \quad \text{mph} \\
\text{Space mean speed in outer lanes, } S &= \text{N/A} \quad \text{mph} \\
\text{Space mean speed for all vehicles, } S &= 49.5 \quad \text{mph}
\end{align*} \]
## Diverge Analysis

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/29/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** CD Rd (East of I-4) EB  
**Junction:** Off Ramp to SR 417 EB  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

### Freeway Data

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of analysis</td>
<td>Diverge</td>
</tr>
<tr>
<td>Number of lanes in freeway</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2070 vph</td>
</tr>
</tbody>
</table>

### Off Ramp Data

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side of freeway</td>
<td>Right</td>
</tr>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>510 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>0 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does adjacent ramp exist?</td>
<td>Yes ✓</td>
</tr>
<tr>
<td>Volume on adjacent ramp</td>
<td>220 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>1584 ft</td>
</tr>
</tbody>
</table>

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Description</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2070</td>
<td>510</td>
<td>220</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>562</td>
<td>139</td>
<td>60</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00 %</td>
<td>0.00 %</td>
<td>0.00 %</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, FHV
Driver population factor, FP
Flow rate, vp

<table>
<thead>
<tr>
<th></th>
<th>0.957</th>
<th>0.957</th>
<th>0.957</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>2351</td>
<td>579</td>
<td>250</td>
<td>pcp/h</td>
</tr>
</tbody>
</table>

**Estimation of V12 Diverge Areas**

\[
L = \text{EQ} \\
P = 1.000 \quad \text{Using Equation 0} \\
v = v + (v - v) P = 2351 \quad \text{pc/h}
\]

\[
\frac{12}{R} \quad \frac{F}{R} \quad \frac{FD}{FD}
\]

**Capacity Checks**

- \( v = \quad 2351 \quad \text{Actual} \)
- \( v = \quad 4500 \quad \text{Maximum} \)
- \( F = \quad \text{No} \)
- \( F = \quad 1772 \quad \text{No} \)
- \( F = \quad 579 \quad \text{No} \)
- \( R = \quad 2000 \quad \text{No} \)
- \( v = \quad 0 \quad \text{pc/h} \quad \text{(Equation 25-15 or 25-16)} \)
- \( v > 2700 \quad \text{No} \quad \text{pc/h?}\)
- \( v > 1.5 \frac{v}{2} \quad \text{No} \quad \text{av34}\)
- \( v = 2351 \quad \text{If yes,} \quad 12 \quad \text{av34} \quad \text{No} \)

**Flow Entering Diverge Influence Area**

<table>
<thead>
<tr>
<th></th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>2351</td>
<td>4400</td>
<td>No</td>
</tr>
</tbody>
</table>

**Level of Service Determination (if not F)**

\[
D = 4.252 + 0.0086 v - 0.009 L = 24.5 \quad \text{pc/mi/ln} \quad \text{Density,} \\
\frac{12}{R} \quad \frac{D}{D}
\]

Level of service for ramp-freeway junction areas of influence \(\checkmark\)

**Speed Estimation**

- \( S = 0.480 \quad \text{D} \)
- \( S = 48.8 \quad \text{mph} \quad \text{Space mean speed in ramp influence area,} \)
- \( S = \quad N/A \quad \text{mph} \quad \text{Space mean speed in outer lanes,} \)
- \( S = 48.8 \quad \text{mph} \quad \text{Space mean speed for all vehicles,} \)
Diverge Analysis

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/29/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** CD Rd (East of I-4) EB  
**Junction:** Off Ramp to SR 429 WB  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

**Freeway Data**

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 / mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>1560 ✓ vph</td>
</tr>
</tbody>
</table>

---

**Off Ramp Data**

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 / mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>220 ✓ vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>0 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

**Adjacent Ramp Data (if one exists)**

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>510 ✓ vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Upstream ✓</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>1584 ft</td>
</tr>
</tbody>
</table>

---

**Conversion to pc/h Under Base Conditions**

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>1560 ✓</td>
<td>220</td>
<td>510 ✓ vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>424</td>
<td>60</td>
<td>139 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9 ✓</td>
<td>9</td>
<td>9 %</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00 %</td>
<td>0.00 %</td>
<td>0.00 %</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Estimation of V12 Diverge Areas

\[ L = \quad \text{(Equation 25-8 or 25-9)} \]
\[ EQ \]
\[ P = 1.000 \quad \text{Using Equation 0} \]
\[ FD \]
\[ V = V + (V - V) \quad P = 1772 \quad \text{pc/h} \]
\[ 12 \quad R \quad F \quad R \quad FD \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1772</td>
<td>4500</td>
<td>No</td>
</tr>
<tr>
<td>1522</td>
<td>4500</td>
<td>No</td>
</tr>
<tr>
<td>250</td>
<td>2000</td>
<td>No</td>
</tr>
<tr>
<td>0 pc/h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is \[ V > 2700 \quad \text{pc/h?} \]
| 3 or av34 | No |

Is \[ V > 1.5 \cdot V / 2 \]
| 3 or av34 | 12 |

If yes, \[ V = 1772 \]

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1772</td>
<td>4400</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination: (if not F)

Density,
\[ D = 4.252 + 0.0086 \cdot V - 0.009 \cdot L = 19.5 \quad \text{pc/mi/ln} \]
\[ R \quad 12 \quad D \]

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

<table>
<thead>
<tr>
<th>Intermediate speed variable,</th>
<th>[ S = 0.451 ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space mean speed in ramp influence area,</td>
<td>[ S = 49.1 \quad \text{mph} ]</td>
</tr>
<tr>
<td>Space mean speed in outer lanes,</td>
<td>[ S = \text{N/A} \quad \text{mph} ]</td>
</tr>
<tr>
<td>Space mean speed for all vehicles,</td>
<td>[ S = 49.1 \quad \text{mph} ]</td>
</tr>
</tbody>
</table>
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: ____________________________ Fax: ____________________________
E-mail: ____________________________

__________________________
Diverge Analysis
__________________________

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/29/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (East of I-4) EB
Junction: Off Ramp to SR 408 WB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

__________________________
Freeway Data
__________________________

Type of analysis Diverge
Number of lanes in freeway 2
Free-flow speed on freeway 55.0 \( \checkmark \) \ mph
Volume on freeway 1560 \( \checkmark \) \ vph

__________________________
Off Ramp Data
__________________________

Side of freeway Right
Number of lanes in ramp 1
Free-Flow speed on ramp 35.0 \( \checkmark \) \ mph
Volume on ramp 220 \( \checkmark \) \ vph
Length of first accel/decel lane 0 \ ft
Length of second accel/decel lane \ ft

__________________________
Adjacent Ramp Data (if one exists)
__________________________

Does adjacent ramp exist? Yes \( \checkmark \)
Volume on adjacent ramp 940 \( \checkmark \) \ vph
Position of adjacent ramp Downstream
Type of adjacent ramp On
Distance to adjacent ramp 1478 \ ft

__________________________
Conversion to pc/h Under Base Conditions
__________________________

Junction Components

<table>
<thead>
<tr>
<th>Volume, ( V ) (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1560</td>
<td>220</td>
<td>940</td>
<td>vph</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak-hour factor, PHF</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
<td>vph</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak 15-min volume, v15</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>424</td>
<td>60</td>
<td>255</td>
<td>v</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trucks and buses</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>9</td>
<td>9</td>
<td>%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recreational vehicles</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terrain type: Grade</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 %</td>
<td>0.00 %</td>
<td>0.00 %</td>
<td>%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>mi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trucks and buses PCE, ET</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5*</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recreational vehicle PCE, ER</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
## Estimation of V12 Diverge Areas

\[
L = \text{EQ} \\
P = 1.000 \quad \text{Using Equation 0} \\
v = v + (v - v) P = 1772 \text{ pc/h} \\
12 R F R FD
\]

### Capacity Checks

<table>
<thead>
<tr>
<th>v = v</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fi</td>
<td>1772</td>
<td>4500</td>
<td>No</td>
</tr>
<tr>
<td>v = v - v</td>
<td>1522</td>
<td>4500</td>
<td>No</td>
</tr>
<tr>
<td>FO</td>
<td>F R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>250</td>
<td>2000</td>
<td>No</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v v 3 or av34</td>
<td>0 pc/h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is \( v > 2700 \text{ pc/h?} \) No

Is \( v > 1.5 \frac{v}{2} \) No

If yes, \( v = 1772 \)

### Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1772</td>
<td>4400</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

### Level of Service Determination (if not F)

\[
D = 4.252 + 0.0086 v - 0.009 L = 19.5 \quad \text{pc/mi/ln} \\
12 R 12 D
\]

Level of service for ramp-freeway junction areas of influence B

### Speed Estimation

| Intermediate speed variable, \( D = 0.451 \) |
| Space mean speed in ramp influence area, \( S = 49.1 \text{ mph} \) |
| Space mean speed in outer lanes, \( S = N/A \text{ mph} \) |
| Space mean speed for all vehicles, \( S = 49.1 \text{ mph} \) |
Diverge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 03/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (East of I-4) EB
Junction: Off Ramp to SR 417 WB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 2
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 1560 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 1
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 220 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 510 vph
Position of adjacent ramp: Upstream
Type of adjacent ramp: Off
Distance to adjacent ramp: 1584 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1560</td>
<td>220</td>
<td>510</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15  
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
    Grade 0.00 % 0.00 % 0.00 %
    Length 0.00 mi 0.00 mi 0.00 mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 1733 244 567 pcp/h

Estimation of V12 Diverge Areas

\[ L = \text{(Equation 25-8 or 25-9)} \]
\[ EQ \]
\[ P = 1.000 \text{ Using Equation 0} \]
\[ FD \]
\[ v = v + (v - v) P = 1733 \text{ pc/h} \]
\[ 12 \text{ R F R FD} \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1733</td>
<td>4500</td>
<td>No</td>
</tr>
<tr>
<td>Fi F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1489</td>
<td>4500</td>
<td>No</td>
</tr>
<tr>
<td>FO F R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>244</td>
<td>2000</td>
<td>No</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 pc/h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ v \] > 2700 pc/h? No
\[ 3 \text{ or av34} \]

\[ v \] > 1.5 \[ v \] /2 No
\[ 3 \text{ or av34} 12 \]

If yes, \[ v = 1733 \] (Equation 25-18)

12A

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1733</td>
<td>4400</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density,
\[ D = 4.252 + 0.0086 v - 0.009 L = 14.7 \text{ pc/mi/ln} \]
\[ R 12 D \]

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,
\[ D = 0.450 \]
\[ S \]

Space mean speed in ramp influence area, \[ S = 49.2 \text{ mph} \]
<table>
<thead>
<tr>
<th>R</th>
<th>S = N/A  mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>S = 49.2  mph</td>
</tr>
</tbody>
</table>

Space mean speed in outer lanes,

Space mean speed for all vehicles,
Diverge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 03/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (East of I-4) EB
Junction: Off Ramp to SR 417 WB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 2
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 1560 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 1
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 220 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 940 vph
Position of adjacent ramp: Downstream
Type of adjacent ramp: On
Distance to adjacent ramp: 1478 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1560</td>
<td>220</td>
<td>940</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15 433 61 261 v
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
Grade 0.00 % 0.00 % 0.00 %
Length 0.00 mi 0.00 mi 0.00 mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fD 1.00 1.00 1.00
Flow rate, vp 1733 244 1044 pcp/h

Estimation of V12 Diverge Areas

\[ L = (\text{Equation 25-8 or 25-9}) \]
\[ P = 1.000 \text{ Using Equation 0} \]
\[ F = 1.000 \text{ pc/h} \]
12 R F R FD

Capacity Checks

\[ v = v \]
\[ Fi F \]
\[ v = v - v \]
\[ FO F R \]
\[ v \]
\[ 244 \]
\[ 2000 \]
\[ No \]
\[ R \]
\[ v - v \]
\[ 0 \text{ pc/h} \]
\[ (\text{Equation 25-15 or 25-16}) \]
\[ 3 \text{ or av34} \]
\[ \text{Is } v - v > 2700 \text{ pc/h?} \]
\[ 3 \text{ or av34} \]
\[ \text{No} \]
\[ \text{Is } v - v > 1.5 v / 2 \]
\[ 3 \text{ or av34} \]
\[ \text{No} \]
\[ \text{If yes, } v = 1733 \]
\[ 12A \]

Flow Entering Diverge Influence Area

\[ v = v \]
\[ 1733 \]
\[ 4400 \]
\[ No \]
\[ 12 \]

Level of Service Determination (if not F)

Density, \[ D = 4.252 + 0.0086 v - 0.009 L = 14.7 \text{ pc/mi/ln} \]
\[ 12 \text{ D} \]

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, \[ D = 0.450 \]
\[ S \]
Space mean speed in ramp influence area, \[ S = 49.2 \text{ mph} \]
<table>
<thead>
<tr>
<th>R</th>
<th>S = N/A mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space mean speed in outer lanes, 0</td>
<td></td>
</tr>
<tr>
<td>Space mean speed for all vehicles,</td>
<td>S = 49.2 mph</td>
</tr>
</tbody>
</table>
Merge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 03/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (East of I-4) EB
Junction: On Ramp from SR 417 EB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Merge
Number of lanes in freeway: 2
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 1340 vph

On Ramp Data

Side of freeway: Left
Number of lanes in ramp: 2
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 940 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: 500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent Ramp: 220 vph
Position of adjacent Ramp: Upstream
Type of adjacent Ramp: Off
Distance to adjacent Ramp: 1478 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th></th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>1340</td>
<td>940</td>
<td>220</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, $v_{15}$: 372, 261, 61
Trucks and buses: 0, 0, 0, %
Recreational vehicles: 0, 0, 0, %
Terrain type: Level, Level, Level
Grade: %, %, %
Length: mi, mi, mi
Trucks and buses PCE, ET: 1.5, 1.5, 1.5
Recreational vehicle PCE, ER: 1.2, 1.2, 1.2
Heavy vehicle adjustment, $f_{HV}$: 1.000, 1.000, 1.000
Driver population factor, $f_{P}$: 1.00, 1.00, 1.00
Flow rate, $v_{p}$: 1489, 1044, 244 pcp/h

Estimation of V12 Merge Areas

$$L = \text{(Equation 25-2 or 25-3)}$$
$$\text{EQ}$$
$$P = 1.000 \text{ Using Equation 0}$$
$$\text{FM}$$
$$v = v \ (P \ ) = 1489 \text{ pc/h}$$
$$12 \text{ F FM}$$

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v_{2533}$</td>
<td>4500</td>
<td>No</td>
</tr>
</tbody>
</table>

$v_{3 or av34} = 0 \text{ pc/h}$ (Equation 25-4 or 25-5)

Is $v > 2700 \text{ pc/h}$? No

Is $v > 1.5 v/2$? No

If yes, $v = 1489 \text{ pc/h}$ (Equation 25-8)

12A

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v_{1489}$</td>
<td>4600</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v + 0.0078 \ - 0.00627 L = 15.3 \text{ pc/mi/ln}$

R 12 A

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, $M = 0.275$

Space mean speed in ramp influence area, $S = 51.4 \text{ mph}$

Space mean speed in outer lanes, $S = N/A \text{ mph}$

Space mean speed for all vehicles, $S = 51.4 \text{ mph}$
Merge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 03/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (East of I-4) EB
Junction: On Ramp from SR 417 EB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Merge
Number of lanes in freeway: 2
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 1340 vph

On Ramp Data

Side of freeway: Left
Number of lanes in ramp: 2
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 940 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: 500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent Ramp: 940 vph
Position of adjacent Ramp: Downstream
Type of adjacent Ramp: Off
Distance to adjacent Ramp: 3010 ft

Conversion to pc/h Under Base Conditions

Junction Components Freeway Ramp Adjacent Ramp
Volume, V (vph) 1340 940 940 vph
Peak-hour factor, PHF 0.90 0.90 0.90
Peak 15-min volume, v15 372 261 261
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
Grade % % %
Length mi mi mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 1489 1044 1044 pcph

Estimation of V12 Merge Areas

\[ L_v = \text{(Equation 25-2 or 25-3)} \]
\[ \text{EQ} \]
\[ P = 1.000 \text{ Using Equation 0} \]
\[ \text{FM} \]
\[ v = v \left( \frac{P}{12} \right) = 1489 \text{ pc/h} \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v = FO</td>
<td>2533</td>
<td>4500</td>
</tr>
<tr>
<td>v = av34</td>
<td>3 or av34</td>
<td>0 pc/h</td>
</tr>
<tr>
<td>Is v &gt; 2700 pc/h?</td>
<td>3 or av34</td>
<td>No</td>
</tr>
<tr>
<td>Is v &gt; 1.5 v / 2</td>
<td>3 or av34</td>
<td>No</td>
</tr>
<tr>
<td>If yes, v = 1489</td>
<td>12A</td>
<td>(Equation 25-8)</td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v = R12</td>
<td>1489</td>
<td>4500</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 15.3 pc/mi/ln
R
R
12
A

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, M = 0.275
Space mean speed in ramp influence area, S = 51.4 mph
Space mean speed in outer lanes, S = N/A mph
Space mean speed for all vehicles, S = 51.4 mph
Diverge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 03/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (East of I-4) EB
Junction: Off Ramp to I-4 EB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 3
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 2280 vph

Off Ramp Data

Side of freeway: Left
Number of lanes in ramp: 2
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 940 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: 500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 940 vph
Position of adjacent ramp: Upstream
Type of adjacent ramp: On
Distance to adjacent ramp: 3010 ft

Conversion to pc/h Under Base Conditions

Junction Components Freeway Ramp Adjacent
Volume, V (vph) 2280 940 940 vph
Peak-hour factor, PHF 0.90 0.90 0.90
Peak 15-min volume, v15 633 261 261 v
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
   Grade 0.00 % 0.00 % 0.00 %
   Length 0.00 mi 0.00 mi 0.00 mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fhv 1.000 1.000 1.000
Driver population factor, fp 1.00 1.00 1.00
Flow rate, vp 2533 1044 1044 pcp/h

--- Estimation of V12 Diverge Areas ---

\[ L = \quad \text{(Equation 25-8 or 25-9)} \]
EQ
\[ P = 0.450 \quad \text{Using Equation 0} \]
FD
\[ v = v + (v - v) P = 1714 \quad \text{pc/h} \]
\[ 12 \ R \ F \ R \ FD \]

--- Capacity Checks ---

\( v = v \)
\( F_i \ F \)
\( v = v - v \)
\( F_O \ F \ R \)
\( v \)
\( 1044 \)
\( 3800 \)
\( 819 \quad \text{pc/h} \quad \text{(Equation 25-15 or 25-16)} \)
\[ 3 \text{ or av34} \]
\( Is \ v \ v > 2700 \text{ pc/h}? \)
\( No \)
\[ 3 \text{ or av34} \]
\( Is \ v \ v > 1.5 v /2 \)
\( No \)
\[ 3 \text{ or av34} \]
\[ 12 \]
\[ If \, yes, \ v = 1714 \quad \text{(Equation 25-18)} \]
\[ 12A \]

--- Flow Entering Diverge Influence Area ---

\( v = v \)
\( 1714 \)
\( 4400 \)
\( No \)
\[ 12 \]

--- Level of Service Determination (if not F) ---

Density, \[ D = 4.252 + 0.0086 v - 0.009 \quad L = 6.2 \quad \text{pc/mi/ln} \]
\[ R \quad 12 \quad D \]
Level of service for ramp-freeway junction areas of influence A

--- Speed Estimation ---

Intermediate speed variable, \[ D = 0.522 \]
\[ S \]
Space mean speed in ramp influence area, \[ S = 48.2 \quad \text{mph} \]
<table>
<thead>
<tr>
<th>R</th>
<th>S</th>
<th>mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>60.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>51.2</td>
<td></td>
</tr>
</tbody>
</table>
Diverge Analysis

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/29/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: I-4 WB
Junction: Off Ramp to SR 46
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis
Number of lanes in freeway 4
Free-flow speed on freeway 65.0 mph
Volume on freeway 7130 vph

Off Ramp Data

Side of freeway
Number of lanes in ramp 2
Free-Flow speed on ramp 35.0 mph
Volume on ramp 1370 vph
Length of first accel/decel lane 0 ft
Length of second accel/decel lane 500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes
Volume on adjacent ramp 3220 vph
Position of adjacent ramp Downstream
Type of adjacent ramp Off
Distance to adjacent ramp 6098 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th></th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>7130</td>
<td>1370</td>
<td>3220 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1937</td>
<td>372</td>
<td>875 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9</td>
<td>9</td>
<td>9 %</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00 %</td>
<td>0.00</td>
<td>0.00 %</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
### Estimation of V12 Diverge Areas

\[ L = \text{EQ} \]
\[ P = 0.260 \text{ Using Equation 0} \]
\[ v = v + (v - v) P = 3257 \text{ pc/h} \]
\[ 12 \text{ R} \quad F \quad R \quad \text{FD} \]

#### Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>8099</td>
<td>9000</td>
<td>No</td>
</tr>
<tr>
<td>6543</td>
<td>9000</td>
<td>No</td>
</tr>
<tr>
<td>1556</td>
<td>3800</td>
<td>No</td>
</tr>
</tbody>
</table>

\[ v = v \]
\[ 3 \text{ or av34} \]
\[ > 2700 \text{ pc/h?} \]
\[ v > 1.5 v / 2 \]

If yes, \[ v = 3257 \] (Equation 25-18)

#### Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3257</td>
<td>4400</td>
<td>No</td>
</tr>
</tbody>
</table>

#### Level of Service Determination (if not F)

\[ D = 4.252 + 0.0086 v - 0.009 L = 27.8 \text{ pc/mi/ln} \]

\[ D = 4.252 + 0.0086 v - 0.009 L = 27.8 \text{ pc/mi/ln} \]

#### Speed Estimation

| Intermediate speed variable, \( D = 0.568 \) |
| Space mean speed in ramp influence area, \( S = 47.6 \text{ mph} \) |
| Space mean speed in outer lanes, \( S = 54.8 \text{ mph} \) |
| Space mean speed for all vehicles, \( S = 51.7 \text{ mph} \) |
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: Fax:
E-mail:

 Merge Analysis

Analyst: CTTR
Agency/Co.: HNTB
Date performed: 3/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (West of I-4) WB
Junction: On Ramp from SR 46 EB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis Merge
Number of lanes in freeway 2
Free-flow speed on freeway 55.0 mph
Volume on freeway 860 vph

On Ramp Data

Side of freeway Right
Number of lanes in ramp 1
Free-flow speed on ramp 35.0 mph
Volume on ramp 650 vph
Length of first accel/decel lane 500 ft
Length of second accel/decel lane ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes
Volume on adjacent Ramp 3210 vph
Position of adjacent Ramp Downstream
Type of adjacent Ramp On
Distance to adjacent Ramp 1426 ft

Conversion to pc/h Under Base Conditions

Junction Components Freeway Ramp Adjacent
Ramp Volume, V (vph) 860 650 3210 vph
Peak-hour factor, PHF 0.90 0.90 0.90

Peak 15-min volume, v15  239  181  892  
v
Trucks and buses  0  0  0  %
Recreational vehicles  0  0  0  %

Terrain type:

Grade % % %
Length mi mi mi

Trucks and buses PCE, ET  1.5  1.5  1.5
Recreational vehicle PCE, ER  1.2  1.2  1.2
Heavy vehicle adjustment, fHV  1.000  1.000  1.000
Driver population factor, fP  1.00  1.00  1.00
Flow rate, vp  956  722  3567  pphp

Estimation of V12 Merge Areas

\[ L = \quad (\text{Equation 25-2 or 25-3}) \]
\[ EQ \]
\[ P = 1.000 \quad \text{Using Equation 0} \]
\[ FM \]
\[ v = v(P) = 956 \quad \text{pc/h} \]
\[ 12 \cdot F \cdot FM \]

Capacity Checks

\[
\begin{array}{ccc}
\text{Actual} & \text{Maximum} & \text{LOS F?} \\
v & 1678 & 4500 \quad \text{No} \\
\end{array}
\]

\( FO \)
\[
\begin{array}{ccc}
v & v & 0 \quad \text{pc/h} \\
3 \text{ or } av34 & & (\text{Equation 25-4 or 25-5}) \\
\end{array}
\]

\( Is \quad v > 2700 \text{ pc/h?} \) \quad \text{No} 
\( 3 \text{ or } av34 \)

\( Is \quad v > 1.5 \frac{v}{2} \) \quad \text{No} 
\( 3 \text{ or } av34 \)

\( 12 \)

\( \text{If yes, } v = 956 \) \quad (\text{Equation 25-8}) 
\( 12A \)

Flow Entering Merge Influence Area

\[
\begin{array}{ccc}
\text{Actual} & \text{Max Desirable} & \text{Violation?} \\
v & 956 & 4600 \quad \text{No} \\
R12 & & \\
\end{array}
\]

Level of Service Determination (if not F)

\[
\begin{aligned}
\text{Density, } D &= 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 15.1 \quad \text{pc/mi/ln} \\
R & \quad R \\
12 & \quad A \\
\end{aligned}
\]

Level of service for ramp-freeway junction areas of influence B

Level of Service Determination (if not F)

\[
\begin{array}{ccc}
\text{Actual} & \text{Max Desirable} & \text{Violation?} \\
v & 956 & 4600 \quad \text{No} \\
R12 & & \\
\end{array}
\]

Density, \[ D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 15.1 \quad \text{pc/mi/ln} \]
\[
\begin{aligned}
R & \quad R \\
12 & \quad A \\
\end{aligned}
\]

Level of service for ramp-freeway junction areas of influence B

Level of Service Determination (if not F)

\[
\begin{array}{ccc}
\text{Actual} & \text{Max Desirable} & \text{Violation?} \\
v & 956 & 4600 \quad \text{No} \\
R12 & & \\
\end{array}
\]

Density, \[ D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 15.1 \quad \text{pc/mi/ln} \]
\[
\begin{aligned}
R & \quad R \\
12 & \quad A \\
\end{aligned}
\]

Level of service for ramp-freeway junction areas of influence B

Intermediate speed variable, \[ M = 0.307 \]

Space mean speed in ramp influence area, \[ S = 51.0 \quad \text{mph} \]

Space mean speed in outer lanes, \[ S = \text{N/A} \quad \text{mph} \]

Space mean speed for all vehicles, \[ S = 51.0 \quad \text{mph} \]
Merge Analysis

Analyst: CTRR  
Agency/Co.: HNTB  
Date performed: 3/05/2010  
Analysis time period: Build Service Road Concept  
Freeway/Dir of Travel: CD Rd (West of I-4) WB  
Junction: On Ramp from I-4 WB  
Jurisdiction: Seminole County  
Analysis Year: 2032  
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>4</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>1510 vph</td>
</tr>
</tbody>
</table>

On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>3210 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>530 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>530 ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
</table>
| Volume on adjacent Ramp | 650 vph  
| Position of adjacent Ramp | Upstream |
| Type of adjacent Ramp | On |
| Distance to adjacent Ramp | 1426 ft |

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>1510</td>
<td>3210</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15  419  892  181  v
Trucks and buses  0  0  0  %
Recreational vehicles  0  0  0  %
Terrain type:  Level  Level  Level
    Grade  %  %  %
    Length  mi  mi  mi
Trucks and buses PCE, ET  1.5  1.5  1.5
Recreational vehicle PCE, ER  1.2  1.2  1.2
Heavy vehicle adjustment, fHV  1.000  1.000  1.000
Driver population factor, fP  1.00  1.00  1.00
Flow rate, vp  1678  3567  722  pcp/h

Estimation of V12 Merge Areas

\[ L = \text{(Equation 25-2 or 25-3)} \]

\[ P = 0.209 \text{ Using Equation 0} \]

\[ \frac{v}{12} \frac{v}{FM} = 351 \text{ pc/h} \]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>5245</td>
<td>9000</td>
<td>No</td>
</tr>
</tbody>
</table>

\[ v = 366 \text{ pc/h} \]  (Equation 25-4 or 25-5)

Is \( v > 2700 \text{ pc/h?} \) No

Is \( v > \frac{1.5v}{2} \) Yes

If yes, \( v = 671 \)  (Equation 25-8)

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>671</td>
<td>4600</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

\[ D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 28.0 - \text{ pc/mi/ln} \]

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,
\[ S = 0.502 \]

Space mean speed in ramp influence area, \( S = 48.5 \text{ mph} \)

Space mean speed in outer lanes, \( S = 55.0 \text{ mph} \)

Space mean speed for all vehicles, \( S = 49.5 \text{ mph} \)
**HCS+: Ramps and Ramp Junctions Release 5.4**

**Phone:**
**Fax:**
**E-mail:**

---

**Merge Analysis**

**Analyst:** CTRR  
**Agency/Co.:** HNTB  
**Date performed:** 3/05/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** CD Rd (West of I-4) WB  
**Junction:** On Ramp from I-4 WB  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

**Freeway Data**

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>4</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>1510 vph</td>
</tr>
</tbody>
</table>

---

**On Ramp Data**

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>3210 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>530 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>530 ft</td>
</tr>
</tbody>
</table>

---

**Adjacent Ramp Data (if one exists)**

| Does adjacent ramp exist? | Yes |
| Volume on adjacent Ramp | 940 vph |
| Position of adjacent Ramp | Downstream |
| Type of adjacent Ramp | Off |
| Distance to adjacent Ramp | 2851 ft |

---

**Conversion to pc/h Under Base Conditions**

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>1510</td>
<td>3210</td>
<td>940</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15 419 892 261 v
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
Grade % % %
Length mi mi mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 1678 3567 1044 pceph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 0.209 Using Equation 0
FM
v = v (P ) = 351 pc/h
12 F FM

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>5245</td>
<td>9000</td>
</tr>
<tr>
<td>FO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>663 pc/h</td>
<td>(Equation 25-4 or 25-5)</td>
</tr>
<tr>
<td>v</td>
<td></td>
<td>3 or av34</td>
</tr>
<tr>
<td>Is v</td>
<td>v &gt; 2700 pc/h?</td>
<td>No</td>
</tr>
<tr>
<td>Is v</td>
<td>v &gt; 1.5 v /2</td>
<td>Yes</td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, v</td>
<td>671</td>
<td>(Equation 25-8)</td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>671</td>
<td>4600</td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 28.0- pc/mi/ln
R R 12 A
Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M = 0.502
Space mean speed in ramp influence area, S = 48.5 mph
Space mean speed in outer lanes, S = 55.0 mph
Space mean speed for all vehicles, S = 49.5 mph

Diverge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 3/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (West of I-4) WB
Junction: Off Ramp to SR 417 WB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 3
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 4720 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 2
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 940 vph
Length of first accel/decel lane: 730 ft
Length of second accel/decel lane: 730 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 3210 vph
Position of adjacent ramp: Upstream
Type of adjacent ramp: On
Distance to adjacent ramp: 2851 ft

Conversion to pc/h Under Base Conditions

Junction Components Freeway Ramp Adjacent
Volume, V (vph) 4720 940 3210 vph
Peak-hour factor, PHF 0.90 0.90 0.90
Peak 15-min volume, v15 1311 261 892
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
   Grade 0.00 % 0.00 % 0.00 %
   Length 0.00 mi 0.00 mi 0.00 mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fp 1.00 1.00 1.00
Flow rate, vp 5244 1044 3567 pcph

Estimation of V12 Diverge Areas

\[ L = \text{ (Equation 25-8 or 25-9)} \]
\[ \text{EQ} \]
\[ P = 0.450 \text{ Using Equation 0} \]
\[ F_D \]
\[ v = v + (v - v) P = 2934 \text{ pc/h} \]
\[ 12 R \times F R F D \]

Capacity Checks

\[ v = v \]
\[ 5244 \]
\[ 6750 \]
\[ \text{No} \]
\[ F_i \times F \]
\[ v = v - v \]
\[ 4200 \]
\[ 6750 \]
\[ \text{No} \]
\[ F_O \times F \times R \]
\[ v \]
\[ 1044 \]
\[ 3800 \]
\[ \text{No} \]
\[ R \]
\[ v \]
\[ \frac{2310}{3 \text{ or av 34}} \text{ pc/h} \]
\[ \text{(Equation 25-15 or 25-16)} \]
\[ v \]
\[ \frac{v}{3 \text{ or av 34}} > 2700 \text{ pc/h?} \]
\[ \text{No} \]
\[ v \]
\[ \frac{v}{3 \text{ or av 34}} > \frac{1.5 \times v}{2} \]
\[ \text{Yes} \]
\[ v \]
\[ 2996 \]
\[ 12 \text{A} \]
\[ \text{(Equation 25-18)} \]

Flow Entering Diverge Influence Area

\[ v = v \]
\[ 2996 \]
\[ 4400 \]
\[ \text{No} \]
\[ 12 \text{A} \]

Level of Service Determination (if not F)

Density,
\[ D = 4.252 + 0.0086 \times v - 0.009 \times L = 10.3 \text{ pc/mi/ln} \]
\[ R \times 12 \times D \]

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,
\[ D = 0.522 \]
\[ S \]
\[ \text{Space mean speed in ramp influence area, } S = 48.2 \text{ mph} \]
<table>
<thead>
<tr>
<th>Description</th>
<th>Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space mean speed in outer lanes, R</td>
<td>S = 55.5</td>
</tr>
<tr>
<td>Space mean speed for all vehicles, 0</td>
<td>S = 51.1</td>
</tr>
</tbody>
</table>
I-4 WB CD Road OFF Ramp to WB SR 417_Downstream Analysis.txt
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: 
Fax: 
E-mail: 

____________________Diverge Analysis____________________

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/29/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (West of I-4) WB
Junction: Off Ramp to SR 417 WB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

____________________Freeway Data____________________

Type of analysis: Diverge
Number of lanes in freeway: 3
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 4730 vph

____________________Off Ramp Data____________________

Side of freeway: Right
Number of lanes in ramp: 1
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 940 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: ft

____________________Adjacent Ramp Data (if one exists)____________________

Does adjacent ramp exist? Yes
Volume on adjacent ramp: 1550 vph
Position of adjacent ramp: Downstream
Type of adjacent ramp: Off
Distance to adjacent ramp: 1531 ft

____________________Conversion to pc/h Under Base Conditions____________________

Junction Components Freeway Ramp Adjacent Ramp
Volume, V (vph) 4730 940 1550 vph
Peak-hour factor, PHF 0.92 0.92 0.92
Peak 15-min volume, v15 1285 255 421 v
Trucks and buses 9 0 9 %
Recreational vehicles 0 0 0 %
Terrain type: Level
Grade 0.00 % 0.00 % 0.00 %
Length 0.00 mi 0.00 mi 0.00 mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 0.957 0.957 0.957
Driver population factor, fP 1.00 1.00 1.00

Page 1
Estimation of V12 Diverge Areas

\[ L = 3018.61 \text{ (Equation 25-8 or 25-9)} \]

\[ P = 0.647 \text{ Using Equation 7} \]

\[ V = \frac{V}{F} + (V - V) \]

\[ V_{12} = \frac{V}{F} R \]

\[ V_{12F} = \frac{V}{F} R \]

Capacity Checks

<table>
<thead>
<tr>
<th>V</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fi</td>
<td>5373</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>v</td>
<td>4305</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>F</td>
<td>1068</td>
<td>2000</td>
<td>No</td>
</tr>
</tbody>
</table>

\[ V_{3 or av34} = 1521 \text{ pc/h} \]  
(Equation 25-15 or 25-16)

Is \[ V_{3 or av34} > 2700 \text{ pc/h?} \]  
No

Is \[ V_{3 or av34} > 1.5 \frac{V}{F} /2 \]  
No

If yes, \[ V_{12A} = 3852 \]  
(Equation 25-18)

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>V</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>3852</td>
<td>4400</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density,

\[ D = 4.252 + 0.0086 \frac{V}{F} - 0.009 \]

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,

\[ D = 0.524 \]

Space mean speed in ramp influence area,

\[ S_R = 48.2 \text{ mph} \]

Space mean speed in outer lanes,

\[ S_0 = 58.3 \text{ mph} \]

Space mean speed for all vehicles,

\[ S = 50.7 \text{ mph} \]
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: 
Fax: 
E-mail: 

---------------------------------------------------------------------

Diverge Analysis

Analyst: CTRR  
Agency/Co.: HNTB  
Date performed: 3/05/2010  
Analysis time period: Build Service Road Concept  
Freeway.Dir of Travel: CD Rd (West of I-4) WB  
Junction: Off Ramp to SR 417 EB  
Jurisdiction: Seminole County  
Analysis Year: 2032  
Description: Wekiva Parkway Project Development & Environment Study

---------------------------------------------------------------------

Freeway Data

Type of analysis: Diverge  
Number of lanes in freeway: 2  
Free-flow speed on freeway: 55.0 mph  
Volume on freeway: 3780 vph

---------------------------------------------------------------------

Off Ramp Data

Side of freeway: Right  
Number of lanes in ramp: 2  
Free-Flow speed on ramp: 35.0 mph  
Volume on ramp: 1550 vph  
Length of first accel/decel lane: 500 ft  
Length of second accel/decel lane: 500 ft

---------------------------------------------------------------------

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes  
Volume on adjacent ramp: 940 vph  
Position of adjacent ramp: Upstream  
Type of adjacent ramp: Off  
Distance to adjacent ramp: 1531 ft

---------------------------------------------------------------------

Conversion to pc/h Under Base Conditions

Junction Components  Freeway Ramp Adjacent
Ramp
Volume, V (vph) 3780 1550 940 vph
Peak-hour factor, PHF 0.90 0.90 0.90

Peak 15-min volume, v15 | 1050 | 431 | 261
Trucks and buses | 0 | 0 | 0 | %
Recreational vehicles | 0 | 0 | 0 | %
Terrain type: Level | Level | Level | Level
Grade | 0.00 | % | 0.00 | % | 0.00 | %
Length | 0.00 | mi | 0.00 | mi | 0.00 | mi
Trucks and buses PCE, ET | 1.5 | 1.5 | 1.5
Recreational vehicle PCE, ER | 1.2 | 1.2 | 1.2
Heavy vehicle adjustment, fHV | 1.000 | 1.000 | 1.000
Driver population factor, FP | 1.00 | 1.00 | 1.00
Flow rate, vp | 4200 | 1722 | 1044 | pcph

Estimation of V12 Diverge Areas

\[
L = (\text{Equation 25-8 or 25-9})
\]

\[
\begin{align*}
EQ \\
P &= 1.000 \\
FD \\
v &= v + (v - v) \\
12 R & \ F \ R \ FD
\end{align*}
\]

Capacity Checks

\[
v = v
\]

\[
\text{Actual} \quad \text{Maximum} \quad \text{LOS F?}
\]

\[
v = v
\]

\[
\begin{align*}
4200 & \quad 4500 & \quad \text{No} \\
Fi & \ F \\
v = v - v & \quad 2478 & \quad 4500 & \quad \text{No} \\
FO & \ F \ R \\
v & \quad 1722 & \quad 3800 & \quad \text{No} \\
R & \quad v \\
v & \quad 0 & \quad \text{pc/h} & \quad (\text{Equation 25-15 or 25-16}) \\
& \quad 3 \text{ or } \text{av34} \\
\text{Is } v & \quad \text{No} \\
v & \quad 2700 & \quad \text{pc/h} \\
& \quad 3 \text{ or } \text{av34} \\
\text{Is } v & \quad v & \quad > 1.5 v /2 \\
& \quad 3 \text{ or } \text{av34} & \quad 12 \\
\text{If yes, } v & \quad 4200 \\
& \quad 12A
\end{align*}
\]

Flow Entering Diverge Influence Area

\[
\begin{align*}
\text{Actual} & \quad \text{Max Desirable} & \quad \text{Violation?} \\
v & \quad 4200 & \quad 4400 & \quad \text{No} \\
12 & \quad \text{Level of Service Determination (if not F)}
\end{align*}
\]

Density,

\[
D = 4.252 + 0.0086 v - 0.009 L = 26.9 \quad \text{pc/mi/ln}
\]

\[
R \quad 12 \quad D
\]

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,

\[
S = 0.583
\]

Space mean speed in ramp influence area,

\[
S = 47.4 \quad \text{mph}
\]
<table>
<thead>
<tr>
<th>R</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space mean speed in outer lanes, 0</td>
<td>N/A</td>
</tr>
<tr>
<td>Space mean speed for all vehicles,</td>
<td>47.4</td>
</tr>
<tr>
<td></td>
<td>mph</td>
</tr>
</tbody>
</table>
HCS+: Ramps and Ramp Junctions Release 5.4

Diverge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 3/05/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (West of I-4) WB
Junction: Off Ramp to SR 417 EB
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 2
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 3780 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 2
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 1550 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: 500 ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 900 vph
Position of adjacent ramp: Downstream
Type of adjacent ramp: Off
Distance to adjacent ramp: 4594 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th></th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>3780</td>
<td>1550</td>
<td>900</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15 1050 431 250 v
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
Grade 0.00 % 0.00 % 0.00 %
Length 0.00 mi 0.00 mi 0.00 mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fp 1.00 1.00 1.00
Flow rate, vp 4200 1722 1000 pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0
FD
v = v + (v - v) P = 4200 pc/h
12 R F R FD

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v = v</td>
<td>4200</td>
<td>4500</td>
</tr>
<tr>
<td>Fi</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>v = v - v</td>
<td>2478</td>
<td>4500</td>
</tr>
<tr>
<td>FO</td>
<td>F</td>
<td>R</td>
</tr>
<tr>
<td>v</td>
<td>1722</td>
<td>3800</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>0 pc/h</td>
<td>(Equation 25-15 or 25-16)</td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is  v  > 2700 pc/h? No
3 or av34

Is  v  > 1.5 v /2 No
3 or av34 12

If yes, v = 4200 (Equation 25-18)

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desireable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>4200</td>
<td>4400</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, D = 4.252 + 0.0086 v - 0.009 L = 26.9 pc/mi/ln
R 12 D
Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, D = 0.583
S
Space mean speed in ramp influence area, S = 47.4 mph
Space mean speed in outer lanes, \( R \quad S = \text{N/A} \quad \text{mph} \)

Space mean speed for all vehicles, \( 0 \quad S = 47.4 \quad \text{mph} \)
### Diverge Analysis

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/29/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** CD Rd (West of I-4) WB  
**Junction:** Off Ramp to CR 46A  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2240 vph</td>
</tr>
</tbody>
</table>

### Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>900 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>0 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>1840 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>1320 ft</td>
</tr>
</tbody>
</table>

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2240</td>
<td>900</td>
<td>1840</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>609</td>
<td>245</td>
<td>500 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00 %</td>
<td>0.00 %</td>
<td>0.00 %</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Estimation of V12 Diverge Areas

\[
L = \text{(Equation 25-8 or 25-9)}
\]

\[
P = \text{1.000 Using Equation 0}
\]

\[
v = v + (v - v) P = 2544 \text{ pc/h}
\]

Capacity Checks

\[
v = v \quad \text{Actual} \quad \text{Maximum} \quad \text{LOS F?}
\]

\[
F_i \quad F \quad 2544 \quad 4500 \quad \text{No}
\]

\[
v = v - v \quad 1522 \quad 4500 \quad \text{No}
\]

\[
F_o \quad F \quad R \quad 1022 \quad 2000 \quad \text{No}
\]

\[
r \quad v \quad 0 \text{ pc/h} \quad \text{(Equation 25-15 or 25-16)}
\]

Is \[
v \quad v \quad > 2700 \text{ pc/h?} \quad \text{No}
\]

\[
\text{Is} \quad v \quad v \quad > 1.5 \quad \frac{v}{2} \quad \text{No}
\]

If yes, \[
v = 2544 \quad \text{12A} \quad \text{(Equation 25-18)}
\]

Flow Entering Diverge Influence Area

\[
v \quad \text{Actual} \quad \text{Max Desirable} \quad \text{Violation?}
\]

\[
12 \quad 2544 \quad 4400 \quad \text{No}
\]

Level of Service Determination (if not F)

\[
D = 4.252 + 0.0086 v - 0.009 L = 26.1 \quad \text{pc/mi/ln}
\]

Density, \[
R \quad 12 \quad D
\]

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, \[
D = 0.520
\]

Space mean speed in ramp influence area, \[
S = 48.2 \quad \text{mph}
\]

Space mean speed in outer lanes, \[
S = \text{N/A} \quad \text{mph}
\]

Space mean speed for all vehicles, \[
S = 48.2 \quad \text{mph}
\]
Diverge Analysis

Analyst: CTR
Agency/Co.: HNTB
Date performed: 7/29/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: CD Rd (West of I-4) WB
Junction: Off Ramp to CR 46A
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Diverge
Number of lanes in freeway: 2
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 2240 vph

Off Ramp Data

Side of freeway: Right
Number of lanes in ramp: 1
Free-Flow speed on ramp: 35.0 mph
Volume on ramp: 900 vph
Length of first accel/decel lane: 0 ft
Length of second accel/decel lane: ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: Yes
Volume on adjacent ramp: 1550 vph
Position of adjacent ramp: Upstream
Type of adjacent ramp: Off
Distance to adjacent ramp: 4594 ft

Conversion to pc/h Under Base Conditions

Junction Components

<table>
<thead>
<tr>
<th></th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2240</td>
<td>900</td>
<td>1550 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92 v</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>609</td>
<td>245</td>
<td>421 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>9</td>
<td>9</td>
<td>9 %</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>0.00 %</td>
<td>0.00</td>
<td>0.00 %</td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
## Estimation of V12 Diverge Areas

\[
L = \text{EQ} \\
F_P = 1.000 \quad \text{Using Equation 0} \\
v = v + (v - v) P = 2544 \text{ pc/h} \\
12 \quad R \quad F \quad R \quad F_D
\]

### Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v = v</td>
<td>2544</td>
<td>4500</td>
</tr>
<tr>
<td>Fi = F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v = v - v</td>
<td>1522</td>
<td>4500</td>
</tr>
<tr>
<td>FO = F R</td>
<td>1022</td>
<td>2000</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v 3 or av34</td>
<td>0 pc/h</td>
<td></td>
</tr>
</tbody>
</table>

Is \(v > 2700\) pc/h? No
Is \(v > 1.5 \frac{v}{2}\) No
If yes, \(v = 2544\) (Equation 25-18)

### Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2544</td>
<td>4400</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Level of Service Determination (if not F)

\[
D = 4.252 + 0.0086 v - 0.009 \quad L = 26.1 \quad \text{pc/mi/ln} \\
R \quad 12 \quad D
\]

Level of service for ramp-freeway junction areas of influence C

### Speed Estimation

- Intermediate speed variable, \(D = 0.520\)
- Space mean speed in ramp influence area, \(S = 48.2\) mph
- Space mean speed in outer lanes, \(S = \text{N/A}\) mph
- Space mean speed for all vehicles, \(S = 48.2\) mph
**Merge Analysis**

**Analyst:** CTR  
**Agency/Co.:** HNTB  
**Date performed:** 7/30/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** CD Rd (West of I-4) WB  
**Junction:** On Ramp from SR 46 EB  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>860 vph</td>
</tr>
</tbody>
</table>

---

### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>650 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>700 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>3220 vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Downstream ✓</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>1426 ft</td>
</tr>
</tbody>
</table>

---

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>860</td>
<td>650</td>
<td>3220 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>234</td>
<td>177</td>
<td>875 v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>✓ 9</td>
<td>9</td>
<td>9 %</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Recreational vehicle PCB, ER</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Estimation of V12 Merge Areas

\[ L = \] (Equation 25-2 or 25-3)
\[ EQ \]
\[ P = 1.000 \quad \text{Using Equation 0} \]
\[ FM \]
\[ v = v \left( \frac{P}{FM} \right) = 977 \quad \text{pc/h} \]

Capacity Checks

\[ v \]
\[ FO \]
\[ v = 0 \quad \text{pc/h} \] (Equation 25-4 or 25-5)
\[ 3 \text{ or } av34 \]
\[ v > 2700 \quad \text{pc/h?} \]
\[ 3 \text{ or } av34 \]
\[ v > \frac{1.5 \cdot v}{2} \quad 12 \]
\[ 3 \text{ or } av34 \]
\[ \text{If yes, } v = 977 \quad \text{(Equation 25-8)} \]

Flow Entering Merge Influence Area

\[ v \]
\[ R12 \]
\[ \text{Actual} \quad 977 \]
\[ \text{Max Desirable} \quad 4600 \]
\[ \text{Violation?} \quad \text{No} \]

Level of Service Determination (if not F)

\[ \text{Density, } D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 14.1 \quad \text{pc/mi/ln} \]
\[ \text{Level of service for ramp-freeway junction areas of influence } B \checkmark \]

Speed Estimation

\[ \text{Intermediate speed variable, } M = 0.294 \]
\[ S \]
\[ \text{Space mean speed in ramp influence area, } S = 51.2 \quad \text{mph} \]
\[ R \]
\[ \text{Space mean speed in outer lanes, } S = N/A \quad \text{mph} \]
\[ 0 \]
\[ \text{Space mean speed for all vehicles, } S = 51.2 \quad \text{mph} \]
HCS+: Ramps and Ramp Junctions Release 5.4

Phone:          Fax:  
E-mail:         

_________________________________________

<table>
<thead>
<tr>
<th>Merge Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst:    CTRR</td>
</tr>
<tr>
<td>Agency/Co.:  HNTB</td>
</tr>
<tr>
<td>Date performed:  3/5/2010</td>
</tr>
<tr>
<td>Analysis time period:  Build Service Road Concept</td>
</tr>
<tr>
<td>Freeway/Dir of Travel:  Wekiva Pkwy. WB</td>
</tr>
<tr>
<td>Junction:    On Ramp from SR 46</td>
</tr>
<tr>
<td>Jurisdiction: Seminole County</td>
</tr>
<tr>
<td>Analysis Year:  2032</td>
</tr>
<tr>
<td>Description:  Wekiva Parkway Project Development &amp; Environment Study</td>
</tr>
</tbody>
</table>

_________________________________________

<table>
<thead>
<tr>
<th>Freeway Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of analysis:  Merge</td>
</tr>
<tr>
<td>Number of lanes in freeway:  3</td>
</tr>
<tr>
<td>Free-flow speed on freeway:  55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway:  3930 vph</td>
</tr>
</tbody>
</table>

_________________________________________

<table>
<thead>
<tr>
<th>On Ramp Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side of freeway:  Right</td>
</tr>
<tr>
<td>Number of lanes in ramp:  2</td>
</tr>
<tr>
<td>Free-flow speed on ramp:  35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp:  780 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane:  800 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane:  640 ft</td>
</tr>
</tbody>
</table>

_________________________________________

<table>
<thead>
<tr>
<th>Adjacent Ramp Data (if one exists)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does adjacent ramp exist?:  Yes</td>
</tr>
<tr>
<td>Volume on adjacent Ramp:  680 vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp:  Upstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp:  On</td>
</tr>
<tr>
<td>Distance to adjacent Ramp:  6336 ft</td>
</tr>
</tbody>
</table>

_________________________________________

<table>
<thead>
<tr>
<th>Conversion to pc/h Under Base Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junction Components</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Volume, V (vph)</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15  1092  217  189  v
Trucks and buses  0  0  0  %
Recreational vehicles  0  0  0  %
Terrain type:  Level  Level  Level
  Grade  %  %  %
  Length  mi  mi  mi
Trucks and buses PCE, ET  1.5  1.5  1.5
Recreational vehicle PCE, ER  1.2  1.2  1.2
Heavy vehicle adjustment, fHV  1.000  1.000  1.000
Driver population factor, fp  1.00  1.00  1.00
Flow rate, vp  4367  867  756  pcp/h

Estimation of V12 Merge Areas

\[
L = \quad \text{(Equation 25-2 or 25-3)}
\]

\[
B = 0.555 \quad \text{Using Equation 0}
\]

FM
\[
v = v (P) = 2424 \quad \text{pc/h}
\]

12  F  FM

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>5234</td>
<td>6750</td>
</tr>
</tbody>
</table>

FO
\[
v = 1943 \quad \text{pc/h} \quad \text{(Equation 25-4 or 25-5)}
\]

3 or av34
\[
v > 2700 \quad \text{pc/h?} \quad \text{No}
\]

Is  v  v  > 1.5  v /2  Yes
3 or av34  12

If yes,  v  = 2495  \quad \text{(Equation 25-8)}
12A

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>2495</td>
<td>4600</td>
</tr>
</tbody>
</table>

12A

Level of Service Determination (if not F)

\[
D = 5.475 + 0.00734 \quad v + 0.0078 \quad v - 0.00627 \quad L = 17.3 \quad \text{pc/mi/ln}
\]

R  R  12  A

Level of service for ramp-free way junction areas of influence B

Speed Estimation

Intermediate speed variable,
\[
S = 0.277
\]

Space mean speed in ramp influence area,  \( S = 51.4 \quad \text{mph} \)

Space mean speed in outer lanes,  \( S = 50.1 \quad \text{mph} \)

Space mean speed for all vehicles,  \( S = 50.9 \quad \text{mph} \)
**Merge Analysis**

Analyst: CTRR  
Agency/Co.: HNTB  
Date performed: 3/5/2010  
Analysis time period: Build Service Road Concept  
Freeway/Dir of Travel: Wekiva Pkwy. WB  
Junction: On Ramp from SR 46  
Jurisdiction: Seminole County  
Analysis Year: 2032  
Description: Wekiva Parkway Project Development & Environment Study

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>3930 vph</td>
</tr>
</tbody>
</table>

### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>780 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>800 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>640 ft</td>
</tr>
</tbody>
</table>

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>360 vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>6684 ft</td>
</tr>
</tbody>
</table>

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, ( V ) (vph)</td>
<td>3930</td>
<td>780</td>
<td>360 vph</td>
</tr>
<tr>
<td>Peak-hour factor, ( PHF )</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15 1092 217 100 v
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
Grade % % %
Length mi mi mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 4367 867 400 pcpd

---

Estimation of V12 Merge Areas

\[ L = \text{ (Equation 25-2 or 25-3)} \]
\[ EQ \]
\[ P = 0.555 \text{ Using Equation 0} \]
\[ FM \]
\[ v = v(P) = 2424 \text{ pc/h} \]
\[ 12 \text{ F FM} \]

---

Capacity Checks

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>5234</td>
<td>6750</td>
<td>No</td>
</tr>
<tr>
<td>FO</td>
<td>1943 pc/h</td>
<td>(Equation 25-4 or 25-5)</td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v v &gt; 2700 pc/h? No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v v &gt; 1.5 v /2 Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, v = 2495 (Equation 25-8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>2495</td>
<td>4600</td>
<td>No</td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Level of Service Determination (if not F)

\[ D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 17.3 \text{ pc/mi/ln} \]
\[ R \]
\[ R \]
\[ 12 \text{ A} \]
Level of service for ramp-freeway junction areas of influence B

---

Speed Estimation

Intermediate speed variable, \[ M = 0.277 \]
Space mean speed in ramp influence area, \[ S = 51.4 \text{ mph} \]
Space mean speed in outer lanes, \[ S = 50.1 \text{ mph} \]
Space mean speed for all vehicles, \[ S = 50.9 \text{ mph} \]
HCS+: Ramps and Ramp Junctions Release 5.4

Phone: 
Fax: 
E-mail: 

--- Diverge Analysis ---

Analyst: CTRR  
Agency/Co.: HNTB  
Date performed: 3/5/2010  
Analysis time period: Build Service Road Concept  
Freeway/Dir of Travel: Wekiva Pkwy. WB  
Junction: Off Ramp to WB CD  
Jurisdiction: Seminole County  
Analysis Year: 2032  
Description: Wekiva Parkway Project Development & Environment Study

--- Freeway Data ---

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>4710 vph</td>
</tr>
</tbody>
</table>

--- Off Ramp Data ---

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>360 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1340 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

--- Adjacent Ramp Data (if one exists) ---

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>780 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Upstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>6684 ft</td>
</tr>
</tbody>
</table>

--- Conversion to pc/h Under Base Conditions ---

<table>
<thead>
<tr>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>4710</td>
<td>360</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15  1308  100  217  v
Trucks and buses  0  0  0  %
Recreational vehicles  0  0  0  %
Terrain type:  
  Level  Level  Level
  Grade  0.00  %  0.00  %  0.00  %
  Length  0.00  mi  0.00  mi  0.00  mi
Trucks and buses PCE, ET  1.5  1.5  1.5
Recreational vehicle PCE, ER  1.2  1.2  1.2
Heavy vehicle adjustment, fHV  1.000  1.000  1.000
Driver population factor, fp  1.00  1.00  1.00
Flow rate, vp
  5233  400  867  peph

Estimation of V12 Diverge Areas

L = 5386.46 (Equation 25-8 or 25-9)

EQ
P = 0.611 Using Equation 5
FD
v = v + (v - v) P = 3352 pc/h
12 R  F  R  FD

Capacity Checks

\[ v = v \]
\[ F_i F \]
\[ v = v - v \]
\[ F_O F R \]
\[ v \]
\[ R \]
\[ v \]
\[ 1881 \text{ pc/h} \] (Equation 25-15 or 25-16)
\[ 3 \text{ or av34} \]

\[ v > 2700 \text{ pc/h?} \] No
\[ 3 \text{ or av34} \]

\[ v > 1.5 v \] /2 No
\[ 3 \text{ or av34} \]

If yes, v = 3352 pc/h
\[ 3352 \]

Flow Entering Diverge Influence Area

\[ v \]
\[ 3352 \]
\[ 4400 \]

Violation?

Level of Service Determination (if not F)

Density,
\[ D = 4.252 + 0.0086 v - 0.009 L = 21.0 \text{ pc/mi/ln} \]
\[ R \]
\[ 12 \]

Level of service for ramp-freeway junction areas of influence C

\[ D = 0.464 \]

Speed Estimation

Intermediate speed variable,
\[ S \]
Space mean speed in ramp influence area, \[ S = 49.0 \text{ mph} \]
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Space mean speed in outer lanes, ( R_0 )</td>
<td>( S = 56.9 ) mph</td>
</tr>
<tr>
<td>Space mean speed for all vehicles, ( R_0 )</td>
<td>( S = 51.6 ) mph</td>
</tr>
</tbody>
</table>
Diverge Analysis

Analyst: CTRR  
Agency/Co.: HNTB  
Date performed: 3/5/2010  
Analysis time period: Build Service Road Concept  
Freeway/Dir of Travel: Wekiva Pkwy, WB  
Junction: Off Ramp to WB CD  
Jurisdiction: Seminole County  
Analysis Year: 2032  
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>4710 vph</td>
</tr>
</tbody>
</table>

Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>360 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1340 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>50 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>6336 ft</td>
</tr>
</tbody>
</table>

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>4710</td>
<td>360</td>
<td>50</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15 1308 100 14 v
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
Grade 0.00 % 0.00 % 0.00 %
Length 0.00 mi 0.00 mi 0.00 mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 5233 400 56 pcpph

Estimation of V12 Diverge Areas

\[ L = \text{EQ} \]

\[ P = 0.611 \text{ Using Equation 5} \]

\[ v = v + (v - v) P = 3352 \text{ pc/h} \]

12 R F R FD

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v = v</td>
<td>5233</td>
<td>6750</td>
</tr>
<tr>
<td>Fi F</td>
<td>v = v - v</td>
<td>4833</td>
</tr>
<tr>
<td>FO F R</td>
<td>v</td>
<td>400</td>
</tr>
<tr>
<td>R</td>
<td>v</td>
<td>1881 pc/h</td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v v &gt; 2700 pc/h?</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v v &gt; 1.5 v /2</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, v = 3352</td>
<td>(Equation 25-18)</td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>3352</td>
<td>4400</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density,

\[ D = 4.252 + 0.0086 v - 0.009 L = 21.0 \text{ pc/mi/h} \]

\[ R \quad 12 \quad D \]

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,

\[ D = 0.464 \]

Space mean speed in ramp influence area,

\[ S = 49.0 \text{ mph} \]
Space mean speed in outer lanes, \( R \)  
\[ S = 56.9 \quad \text{mph} \]

Space mean speed for all vehicles,  
\[ S = 51.6 \quad \text{mph} \]
Merge Analysis

Analyst: CTRR
Agency/Co.: HNTB
Date performed: 3/5/2010
Analysis time period: Build Service Road Concept
Freeway/Dir of Travel: Wekiva Pkwy, WB
Junction: On Ramp from WB CD
Jurisdiction: Seminole County
Analysis Year: 2032
Description: Wekiva Parkway Project Development & Environment Study

Freeway Data

Type of analysis: Merge
Number of lanes in freeway: 4
Free-flow speed on freeway: 55.0 mph
Volume on freeway: 4350 vph

On Ramp Data

Side of freeway: Right
Number of lanes in ramp: 1
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 50 vph
Length of first accel/decel lane: 500 ft
Length of second accel/decel lane: ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist? Yes
Volume on adjacent Ramp: 360 vph
Position of adjacent Ramp: Upstream
Type of adjacent Ramp: Off
Distance to adjacent Ramp: 6336 ft

Conversion to pc/h Under Base Conditions

Junction Components Freeway Ramp Adjacent
Volume, V (vph) 4350 50 360 vph
Peak-hour factor, PHF 0.90 0.90 0.90
Peak 15-min volume, v15 1208 14 100
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
Grade % % %
Length mi mi mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fp 1.00 1.00 1.00
Flow rate, vp 4833 56 400 peph

Estimation of V12 Merge Areas

\[
L = \text{EQ} \\
P = 0.211 \text{ Using Equation 4} \\
\frac{v}{12}\text{ FM} = \frac{1019}{12}\text{ pc/h}
\]

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v 4889</td>
<td>9000</td>
<td>No</td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

\[
\frac{v}{3}\text{ or av34} = 1907\text{ pc/h} \quad \text{(Equation 25-4 or 25-5)}
\]

Is \( \frac{v}{3}\text{ or av34} > 2700\text{ pc/h} \)? No

Is \( \frac{v}{3}\text{ or av34} > \frac{1.5}{12}v \)? Yes

If yes, \( v = 1933 \) (Equation 25-8)

12A

Level of Service Determination (if not F)

Density, \( D = 5.475 + 0.00734v + 0.0078v - 0.00627\ L = 17.8 \text{ pc/mi}/\text{ln} \)

\( R = 12 \text{ A} \)

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, \( M = 0.315 \)
Space mean speed in ramp influence area, \( S = 50.9 \text{ mph} \)
Space mean speed in outer lanes, \( 0 \)
Space mean speed for all vehicles, \( S = 51.3 \text{ mph} \)

HCS+: Ramps and Ramp Junctions Release 5.4

Phone:       Fax: 
E-mail:  

Diverge Analysis

Analyst:      CTRR
Agency/Co.:    HNTB
Date performed:  3/5/2010
Analysis time period:  Build Service Road Concept
Freeway/Dir of Travel:  Wekiva Pkwy. EB
Junction:       Off Ramp to EB CD
Jurisdiction:   Seminole County
Analysis Year:  2032
Description:   Wekiva Parkway Project Development & Environment Study

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2570 vph</td>
</tr>
</tbody>
</table>

Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>40 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>500 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>300 vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>Downstream</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>On</td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>6336 ft</td>
</tr>
</tbody>
</table>

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2570</td>
<td>40</td>
<td>300 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15 714 11 83 v
Trucks and buses 0 0 0 %
Recreational vehicles 0 0 0 %
Terrain type: Level Level Level
  Grade 0.00 % 0.00 % 0.00 %
  Length 0.00 mi 0.00 mi 0.00 mi
Trucks and buses PCE, ET 1.5 1.5 1.5
Recreational vehicle PCE, ER 1.2 1.2 1.2
Heavy vehicle adjustment, fHV 1.000 1.000 1.000
Driver population factor, fP 1.00 1.00 1.00
Flow rate, vp 2856 44 333 pcpp

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 0.687 Using Equation 5
FD
v = v + (v - v) P = 1975 pc/h
12 R F R FD

Capacity Checks

v = v
Actual 2856 Maximum 6750 LOS F? No
Fi F
v = v - v
Actual 2812 Maximum 6750 LOS F? No
FO F R
v 44 Maximum 2000 LOS F? No
R
v v 881 pc/h (Equation 25-15 or 25-16)
3 or av34
Is v v > 2700 pc/h? No
3 or av34
Is v v > 1.5 v /2 No
3 or av34
If yes, v = 1975
12
Flow Entering Diverge Influence Area

v 1975 Max Desirable 4400 Violation? No
12

Level of Service Determination (if not F)

Density, D = 4.252 + 0.0086 v - 0.009 L = 16.7 pc/mi/ln
12 D
Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D = 0.432
S
Space mean speed in ramp influence area, S = 49.4 mph
\( R \)

Space mean speed in outer lanes, \( S = 60.3 \) mph

Space mean speed for all vehicles, \( S = 52.3 \) mph
**Merge Analysis**

**Analyst:** CTRR  
**Agency/Co.:** HNTB  
**Date performed:** 3/5/2010  
**Analysis time period:** Build Service Road Concept  
**Freeway/Dir of Travel:** Wekiva Pkwy, EB  
**Junction:** On Ramp from EB CD  
**Jurisdiction:** Seminole County  
**Analysis Year:** 2032  
**Description:** Wekiva Parkway Project Development & Environment Study

---

**Freeway Data**

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>55.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2530 vph</td>
</tr>
</tbody>
</table>

---

**On Ramp Data**

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>300 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>500 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

**Adjacent Ramp Data (if one exists)**

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>40 vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td>Upstream</td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td>Off</td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>6336 ft</td>
</tr>
</tbody>
</table>

---

**Conversion to pc/h Under Base Conditions**

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2530</td>
<td>300</td>
<td>40 vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Peak 15-min volume, v15  703  83  11  v
Trucks and buses  0  0  0  %
Recreational vehicles  0  0  0  %
Terrain type:  Level  Level  Level
Grade  %  %  %
Length  mi  mi  mi
Trucks and buses PCE, ET  1.5  1.5  1.5
Recreational vehicle PCE, ER  1.2  1.2  1.2
Heavy vehicle adjustment, fHV  1.000  1.000  1.000
Driver population factor, fP  1.00  1.00  1.00
Flow rate, vp  2811  333  44  peph

Estimation of V12 Merge Areas

L =  323.02  (Equation 25-2 or 25-3)
EQ
P = 0.591  Using Equation 1
FM
v = v(P) = 1663  pc/h
12  F  FM

Capacity Checks

\[
\text{Actual} \quad \text{Maximum} \quad \text{LOS F?} \\
\begin{array}{ccc}
v & 3144 & 6750 \\
\text{FO} & \text{v} & \text{v} \\
& 1148 \text{ pc/h} & (\text{Equation 25-4 or 25-5}) \\
\text{3 or av34} & v & v > 2700 \text{ pc/h?} \\
\text{3 or av34} & \text{No} \\
\text{3 or av34} & v & v > 1.5 \text{ v} / 2 \\
\text{12} & \text{No} \\
\text{12A} & \text{v} & \text{1663} \\
\end{array}
\]

Flow Entering Merge Influence Area

\[
\text{Actual} \quad \text{Max Desirable} \quad \text{Violation?} \\
\begin{array}{ccc}
v & 1663 & 4600 \\
\text{R12} & \text{v} & \text{No} \\
\end{array}
\]

Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 17.8  pc/mi/ln
R  R  12  A
Level of service for ramp-freeway junction areas of influence  B

Speed Estimation

Intermediate speed variable, \( M = 0.315 \)
Space mean speed in ramp influence area, \( S = 50.9 \text{ mph} \)
Space mean speed in outer lanes, \( S = 52.7 \text{ mph} \)
Space mean speed for all vehicles, \( S = 51.5 \text{ mph} \)