

Florence & Hutcheson  
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Columbia, SC 29201

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 7/8/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 NB  
Junction: Butler Rd off-ramp  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5999	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	451	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1299	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2960	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5999	451	1299	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1666	125	361	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	7265	546	1573	pcph

#### Estimation of V12 Diverge Areas

$$L = \text{(Equation 13-12 or 13-13)}$$

EQ

$$P = 0.553 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4263 \quad \text{pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7265	6900	Yes
$v_{FO} = v_F - v_R$	6719	6900	No
$v_R$	546	2100	No
$v_3$ or $v_{av34}$	3002 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?		Yes	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 4565$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12A}$	4565	4400	No

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

Density,	$D = 4.252 + 0.0086 v_R - 0.009 \frac{L}{D}$	$= 30.0$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

#### Speed Estimation

Intermediate speed variable,	$D_S = 0.347$	
Space mean speed in ramp influence area,	$S_R = 53.8$	mph
Space mean speed in outer lanes,	$S_0 = 59.2$	mph
Space mean speed for all vehicles,	$S = 55.7$	mph

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 7/8/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 NB  
Junction: Butler Rd on-ramp  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5548	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1299	vph
Length of first accel/decel lane	1100	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	451	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2960	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5548	1299	451	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1541	361	125	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	6719	1573	546	pcph

-----Estimation of V12 Merge Areas-----

$$L = 2214.29 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.608 \text{ Using Equation 1}$$

$$FM$$

$$v_{12} = v_F(P) = 4087 \text{ pc/h}$$

-----Capacity Checks-----

	Actual	Maximum	LOS F?
v <sub>FO</sub>	8292	6900	Yes
v <sub>3</sub> or v <sub>av34</sub>	2632 pc/h	(Equation 13-14 or 13-17)	
Is v <sub>3</sub> or v <sub>av34</sub> > 2700 pc/h?		No	
Is v <sub>3</sub> or v <sub>av34</sub> > 1.5 v <sub>12</sub> / 2		No	
If yes, v <sub>12A</sub> = 4087		(Equation 13-15, 13-16, 13-18, or 13-19)	

-----Flow Entering Merge Influence Area-----

	Actual	Max Desirable	Violation?
v <sub>R12</sub>	8292	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 42.0 \text{ pc/mi/ln}$$

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

-----Speed Estimation-----

Intermediate speed variable,	M	= 1.342	
Space mean speed in ramp influence area,	S <sub>R</sub>	= 35.8	mph
Space mean speed in outer lanes,	S <sub>0</sub>	= 51.5	mph
Space mean speed for all vehicles,	S	= 39.7	mph

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 7/8/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 SB  
Junction: Butler Rd off-ramp  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4326	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1127	vph
Length of first accel/decel lane	1000	ft
Length of second accel/decel lane		ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	342	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2570	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4326	1127	342	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1202	313	95	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5239	1365	414	pcph

#### Estimation of V12 Diverge Areas

$$L = \text{(Equation 13-12 or 13-13)}$$

EQ

$$P = 0.566 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3559 \quad \text{pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5239	6900	No
$v_{FO} = v_F - v_R$	3874	6900	No
$v_R$	1365	2100	No
$v_3$ or $v_{av34}$	1680 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3559$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12}$	3559	4400	No

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

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 25.9$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence C			

#### Speed Estimation

Intermediate speed variable,	$D_S = 0.421$	
Space mean speed in ramp influence area,	$S_R = 52.4$	mph
Space mean speed in outer lanes,	$S_0 = 63.2$	mph
Space mean speed for all vehicles,	$S = 55.4$	mph

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 7/8/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 SB  
Junction: Butler Rd on-ramp  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3199	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	342	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1127	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2570	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3199	342	1127	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	889	95	313	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3874	414	1365	pcph

#### Estimation of V12 Merge Areas

$$L = 1535.03 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.619 \text{ Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2400 \text{ pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{FO}$	4288	6900	No
$v_3 \text{ or } v_{av34}$	1474 pc/h	(Equation 13-14 or 13-17)	
Is $v_3 \text{ or } v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3 \text{ or } v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 2400$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
$v_{R12}$	4288	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 17.8 \text{ pc/mi/ln}$$

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

#### Speed Estimation

Intermediate speed variable,	$M_S = 0.251$	
Space mean speed in ramp influence area,	$S_R = 55.5$	mph
Space mean speed in outer lanes,	$S_0 = 56.5$	mph
Space mean speed for all vehicles,	$S = 55.8$	mph



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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 7/8/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 NB  
Junction: Butler Rd off-ramp  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6638	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	368	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1438	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2960	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6638	368	1438	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1844	102	399	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	8039	446	1742	pcph

#### Estimation of V12 Diverge Areas

L = (Equation 13-12 or 13-13)

EQ

P = 0.539 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 4535 \text{ pc/h}$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	8039	6900	Yes
$v_{FO} = v_F - v_R$	7593	6900	Yes
$v_R$	446	2100	No
$v_3$ or $v_{av34}$	3504 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700 \text{ pc/h?}$		Yes	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 5339$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12A}$	5339	4400	Yes

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

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 36.7 \text{ pc/mi/ln}$
Level of service for ramp-freeway junction areas of influence F		

#### Speed Estimation

Intermediate speed variable,	$D_S = 0.338$	
Space mean speed in ramp influence area,	$S_R = 53.9$	mph
Space mean speed in outer lanes,	$S_0 = 59.2$	mph
Space mean speed for all vehicles,	$S = 55.6$	mph

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 7/8/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 NB  
Junction: Butler Rd on-ramp  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6270	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1438	vph
Length of first accel/decel lane	1100	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	368	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2960	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6270	1438	368	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1742	399	102	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	7594	1742	446	pcph

-----Estimation of V12 Merge Areas-----

$$L = 2437.70 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.608 \text{ Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 4619 \text{ pc/h}$$

-----Capacity Checks-----

	Actual	Maximum	LOS F?
v <sub>FO</sub>	9336	6900	Yes
v <sub>3</sub> or v <sub>av34</sub>	2975 pc/h	(Equation 13-14 or 13-17)	
Is v <sub>3</sub> or v <sub>av34</sub> > 2700 pc/h?		Yes	
Is v <sub>3</sub> or v <sub>av34</sub> > 1.5 v <sub>12</sub> / 2		No	
If yes, v <sub>12A</sub> = 4894		(Equation 13-15, 13-16, 13-18, or 13-19)	

-----Flow Entering Merge Influence Area-----

	Actual	Max Desirable	Violation?
v <sub>12A</sub>	9336	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 49.5 \text{ pc/mi/ln}$$

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

-----Speed Estimation-----

Intermediate speed variable,	M <sub>S</sub> = 3.194	
Space mean speed in ramp influence area,	S <sub>R</sub> = 2.5	mph
Space mean speed in outer lanes,	S <sub>0</sub> = 51.1	mph
Space mean speed for all vehicles,	S = 3.5	mph

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### Diverge Analysis

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Agency/Co.: Florence & Hutcheson  
Date performed: 7/8/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 SB  
Junction: Butler Rd off-ramp  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	7893	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1167	vph
Length of first accel/decel lane	1000	ft
Length of second accel/decel lane		ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	650	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2570	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7893	1167	650	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	2193	324	181	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	9559	1413	787	pcph

#### Estimation of V12 Diverge Areas

$$L = \text{(Equation 13-12 or 13-13)}$$

EQ

$$P = 0.456 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 5128 \quad \text{pc/h}$$

#### Capacity Checks

		Actual	Maximum	LOS F?
$v_{Fi} = v_F$		9559	6900	Yes
$v_{FO} = v_F - v_R$		8146	6900	Yes
$v_R$		1413	2100	No
$v_3$ or $v_{av34}$		4431 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?			Yes	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$			No	
If yes, $v_{12A} = 6859$			(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12A}$	6859	4400	Yes

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

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$		54.2	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F				

#### Speed Estimation

Intermediate speed variable,	$D = 0.425$		
Space mean speed in ramp influence area,	$S_R = 52.3$	mph	
Space mean speed in outer lanes,	$S_0 = 59.2$	mph	
Space mean speed for all vehicles,	$S = 54.1$	mph	

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 7/8/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 SB  
Junction: Butler Rd on-ramp  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6726	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	650	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1167	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2570	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6726	650	1167	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1868	181	324	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	8146	787	1413	pcph

-----Estimation of V12 Merge Areas-----

$$L = 2529.06 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.619 \text{ Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 5046 \text{ pc/h}$$

-----Capacity Checks-----

	Actual	Maximum	LOS F?
v <sub>FO</sub>	8933	6900	Yes
v <sub>3</sub> or v <sub>av34</sub>	3100 pc/h	(Equation 13-14 or 13-17)	
Is v <sub>3</sub> or v <sub>av34</sub> > 2700 pc/h?		Yes	
Is v <sub>3</sub> or v <sub>av34</sub> > 1.5 v <sub>12</sub> / 2		No	
If yes, v <sub>12A</sub> = 5446		(Equation 13-15, 13-16, 13-18, or 13-19)	

-----Flow Entering Merge Influence Area-----

	Actual	Max Desirable	Violation?
v <sub>12A</sub>	8933	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 44.3 \text{ pc/mi/ln}$$

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

-----Speed Estimation-----

Intermediate speed variable,	M <sub>S</sub> = 2.172	
Space mean speed in ramp influence area,	S <sub>R</sub> = 20.9	mph
Space mean speed in outer lanes,	S <sub>0</sub> = 51.1	mph
Space mean speed for all vehicles,	S = 25.4	mph



## HCS 2010: Basic Freeway Segments Release 6.1

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## Operational Analysis

Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/24/2011  
Analysis Time Period: AM  
Freeway/Direction: I-385 NB  
From/To: I-385NB - I-385NB CD Post-Div  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

## Flow Inputs and Adjustments

Volume, V	3068	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	852	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	1239	pc/h/ln

## Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

## LOS and Performance Measures

Flow rate, vp	1239	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	3	
Density, D	22.5	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

## HCS 2010: Basic Freeway Segments Release 6.1

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## Operational Analysis

Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/24/2011  
Analysis Time Period: AM  
Freeway/Direction: I-385 NB  
From/To: I-385NB - I-385NB CD (Pre-Div)  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

## Flow Inputs and Adjustments

Volume, V	6847	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1902	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	1658	pc/h/ln

## Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	5	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

## LOS and Performance Measures

Flow rate, vp	1658	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	5	
Density, D	30.1	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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### Operational Analysis

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Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/24/2011  
Analysis Time Period: AM  
Freeway/Direction: I-385 NB  
From/To: I-385NB - I-385NB CD (Ramp)  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

---

### Flow Inputs and Adjustments

---

Volume, V	3779	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1050	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	1526	pc/h/ln

---

### Speed Inputs and Adjustments

---

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

---

### LOS and Performance Measures

---

Flow rate, vp	1526	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	3	
Density, D	27.7	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 7/8/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 NB  
Junction: Woodruff - I-385 NB  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge		
Number of lanes in freeway	3		
Free-flow speed on freeway	55.0	mph	
Volume on freeway	3068	vph	

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right		
Number of lanes in ramp	1		
Free-flow speed on ramp	45.0	mph	
Volume on ramp	1422	vph	
Length of first accel/decel lane	600	ft	
Length of second accel/decel lane		ft	

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	No		
Volume on adjacent Ramp		vph	
Position of adjacent Ramp			
Type of adjacent Ramp			
Distance to adjacent Ramp		ft	

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3068	1422		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	852	395		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3716	1722	pcph

-----Estimation of V12 Merge Areas-----

$$L = \text{(Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.594 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F(P) = 2208 \quad \text{pc/h}$$

-----Capacity Checks-----

	Actual	Maximum	LOS F?
v <sub>FO</sub>	5438	6750	No
v <sub>3</sub> or v <sub>av34</sub>	1508 pc/h	(Equation 13-14 or 13-17)	
Is v <sub>3</sub> or v <sub>av34</sub> > 2700 pc/h?		No	
Is v <sub>3</sub> or v <sub>av34</sub> > 1.5 v <sub>12</sub> / 2		No	
If yes, v <sub>12A</sub> = 2208		(Equation 13-15, 13-16, 13-18, or 13-19)	

-----Flow Entering Merge Influence Area-----

	Actual	Max Desirable	Violation?
v <sub>R12</sub>	5438	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 31.6 \quad \text{pc/mi/ln}$$

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

-----Speed Estimation-----

Intermediate speed variable,	M <sub>S</sub> = 0.466	
Space mean speed in ramp influence area,	S <sub>R</sub> = 48.9	mph
Space mean speed in outer lanes,	S <sub>0</sub> = 51.4	mph
Space mean speed for all vehicles,	S = 49.6	mph

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 SB  
Junction: I-385 SB to Woodruff  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3060	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	818	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	2537	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	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3060		818		2537	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	850		227		705	v
Trucks and buses	18		18		18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3706	991	3073	pcph

# Estimation of V12 Diverge Areas

L = (Equation 13-12 or 13-13)

EQ

P = 0.622 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 2679$  pc/h

# Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3706	6750	No
$v_{FO} = v_F - v_R$	2715	6750	No
$v_R$	991	2100	No
$v_3$ or $v_{av34}$	1027 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 2679$		(Equation 13-15, 13-16, 13-18, or 13-19)	

# Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12}$	2679	4400	No

# Level of Service Determination (if not F)

Density,  $D = 4.252 + 0.0086 v_R - 0.009 L_D = 27.3$  pc/mi/ln

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

# Speed Estimation

Intermediate speed variable,	$D_S = 0.387$	
Space mean speed in ramp influence area,	$S_R = 50.0$	mph
Space mean speed in outer lanes,	$S_0 = 60.2$	mph
Space mean speed for all vehicles,	$S = 52.4$	mph

## HCS 2010: Basic Freeway Segments Release 6.1

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## Operational Analysis

Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/25/2011  
Analysis Time Period: AM  
Freeway/Direction: I-385 SB  
From/To: I-385SB C-D - I-385SB PostMrge  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

## Flow Inputs and Adjustments

Volume, V	4326	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1202	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	1048	pc/h/ln

## Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	5	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

## LOS and Performance Measures

Flow rate, vp	1048	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	5	
Density, D	19.1	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.



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## Operational Analysis

Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/25/2011  
Analysis Time Period: AM  
Freeway/Direction: I-385 SB  
From/To: I-385SB C-D - I-385SB PreMerge  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

## Flow Inputs and Adjustments

Volume, V	2242	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	623	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	905	pc/h/ln

## Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

## LOS and Performance Measures

Flow rate, vp	905	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	3	
Density, D	16.5	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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### Operational Analysis

Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/25/2011  
Analysis Time Period: AM  
Freeway/Direction: I-385 SB  
From/To: I-385SB C-D - I-385SB (Ramp)  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Flow Inputs and Adjustments

Volume, V	2084	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	579	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	841	pc/h/ln

### Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

### LOS and Performance Measures

Flow rate, vp	841	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	3	
Density, D	15.3	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 SB  
Junction: I-385 SB C-D - I-385SB  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2242	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	2084	vph
Length of first accel/decel lane	1150	ft
Length of second accel/decel lane	1500	ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2242	2084		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	623	579		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	%
Length	mi	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2715	2524	pcph

#### Estimation of V12 Merge Areas

$$L = \text{(Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.555 \quad \text{Using Equation 0}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 1507 \quad \text{pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
v <sub>FO</sub>	5239	6750	No
v <sub>3</sub> or v <sub>av34</sub>	1208 pc/h	(Equation 13-14 or 13-17)	
Is v <sub>3</sub> or v <sub>av34</sub> > 2700 pc/h?		No	
Is v <sub>3</sub> or v <sub>av34</sub> > 1.5 v <sub>12</sub> / 2		Yes	
If yes, v <sub>12A</sub> = 1551		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v <sub>12A</sub>	5239	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 12.3 \quad \text{pc/mi/ln}$$

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

#### Speed Estimation

Intermediate speed variable,	M <sub>S</sub> = 0.209	
Space mean speed in ramp influence area,	S <sub>R</sub> = 52.3	mph
Space mean speed in outer lanes,	S <sub>0</sub> = 52.6	mph
Space mean speed for all vehicles,	S = 52.4	mph

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## Operational Analysis

Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/25/2011  
Analysis Time Period: PM  
Freeway/Direction: I-385 NB  
From/To: I-385NB - I-385NB CD Post-Div  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

## Flow Inputs and Adjustments

Volume, V	4041	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1123	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	1631	pc/h/ln

## Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

## LOS and Performance Measures

Flow rate, vp	1631	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	3	
Density, D	29.7	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

## HCS 2010: Basic Freeway Segments Release 6.1

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## Operational Analysis

Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/25/2011  
Analysis Time Period: PM  
Freeway/Direction: I-385 NB  
From/To: I-385NB - I-385NB CD (Pre-Div)  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

## Flow Inputs and Adjustments

Volume, V	7708	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	2141	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	1867	pc/h/ln

## Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	5	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

## LOS and Performance Measures

Flow rate, vp	1867	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	54.9	mi/h
Number of lanes, N	5	
Density, D	34.0	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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### Operational Analysis

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Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/25/2011  
Analysis Time Period: PM  
Freeway/Direction: I-385 NB  
From/To: I-385NB - I-385NB CD (Ramp)  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

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### Flow Inputs and Adjustments

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Volume, V	3667	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1019	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	1480	pc/h/ln

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### Speed Inputs and Adjustments

---

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

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### LOS and Performance Measures

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Flow rate, vp	1480	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	3	
Density, D	26.9	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 NB  
Junction: Woodruff - I-385 NB  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4041	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1317	vph
Length of first accel/decel lane	600	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4041	1317		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1123	366		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%		%
Length	mi	mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		



Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4894	1595	pcph

# Estimation of V12 Merge Areas

$L =$  (Equation 13-6 or 13-7)  
 $EQ$   
 $P = 0.594$  Using Equation 1  
 $FM$   
 $v_{12} = v_F (P_{FM}) = 2909$  pc/h

# Capacity Checks

	Actual	Maximum	LOS F?
$v_{FO}$	6489	6750	No
$v_3$ or $v_{av34}$	1985 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 2909$		(Equation 13-15, 13-16, 13-18, or 13-19)	

# Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
$v_{R12}$	6489	4600	No

# Level of Service Determination (if not F)

Density,  $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 36.1$  pc/mi/ln  
 Level of service for ramp-freeway junction areas of influence E

# Speed Estimation

Intermediate speed variable,	$M_S = 0.619$	
Space mean speed in ramp influence area,	$S_R = 46.9$	mph
Space mean speed in outer lanes,	$S_0 = 49.7$	mph
Space mean speed for all vehicles,	$S = 47.7$	mph

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 SB  
Junction: I-385 SB to Woodruff  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	6352	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1312	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	3625	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	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6352	1312	3625	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1764	364	1007	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	7693	1589	4390	pcph

#### Estimation of V12 Diverge Areas

L = (Equation 13-12 or 13-13)

EQ

P = 0.495 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 4608 \text{ pc/h}$

#### Capacity Checks

		Actual	Maximum	LOS F?
$v_{Fi} = v_F$		7693	6750	Yes
$v_{FO} = v_F - v_R$		6104	6750	No
$v_R$		1589	2100	No
$v_3$ or $v_{av34}$		3085 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700 \text{ pc/h?}$			Yes	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$			No	
If yes, $v_{12A} = 4993$			(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12A}$	4993	4400	Yes

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

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$			
				47.2 pc/mi/ln
Level of service for ramp-freeway junction areas of influence F				

#### Speed Estimation

Intermediate speed variable,	$D = 0.441$		
	S		
Space mean speed in ramp influence area,	$S_R = 49.3$	mph	
	R		
Space mean speed in outer lanes,	$S_0 = 53.7$	mph	
	0		
Space mean speed for all vehicles,	$S = 50.7$	mph	

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## Operational Analysis

Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/25/2011  
Analysis Time Period: PM  
Freeway/Direction: I-385 SB  
From/To: I-385SB C-D - I-385SB PostMrge  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

## Flow Inputs and Adjustments

Volume, V	7893	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	2193	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	1912	pc/h/ln

## Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	5	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

## LOS and Performance Measures

Flow rate, vp	1912	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	54.7	mi/h
Number of lanes, N	5	
Density, D	35.0-	pc/mi/ln
Level of service, LOS	D	

Overall results are not computed when free-flow speed is less than 55 mph.

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## Operational Analysis

Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/25/2011  
Analysis Time Period: PM  
Freeway/Direction: I-385 SB  
From/To: I-385SB C-D - I-385SB PreMerge  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

## Flow Inputs and Adjustments

Volume, V	5040	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1400	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	2035	pc/h/ln

## Speed Inputs and Adjustments

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

## LOS and Performance Measures

Flow rate, vp	2035	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	53.6	mi/h
Number of lanes, N	3	
Density, D	37.9	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

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### Operational Analysis

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Analyst: JP  
Agency or Company: Florence & Hutcheson  
Date Performed: 8/25/2011  
Analysis Time Period: PM  
Freeway/Direction: I-385 SB  
From/To: I-385SB C-D - I-385SB (Ramp)  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

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### Flow Inputs and Adjustments

---

Volume, V	2853	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	793	v
Trucks and buses	18	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	-	%
Segment length	-	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.917	
Driver population factor, fp	1.00	
Flow rate, vp	1152	pc/h/ln

---

### Speed Inputs and Adjustments

---

Lane width	-	ft
Right-side lateral clearance	-	ft
Total ramp density, TRD	-	ramps/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	-	mi/h
Lateral clearance adjustment, fLC	-	mi/h
TRD adjustment	-	mi/h
Free-flow speed, FFS	55.0	mi/h

---

### LOS and Performance Measures

---

Flow rate, vp	1152	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	3	
Density, D	20.9	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 SB  
Junction: I-385 SB C-D - I-385SB  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5040	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	2853	vph
Length of first accel/decel lane	1150	ft
Length of second accel/decel lane	1500	ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5040	2853		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1400	793		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%		%
Length	mi	mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	6104	3455	pcph

# Estimation of V12 Merge Areas

$L =$  (Equation 13-6 or 13-7)  
 $EQ$   
 $P = 0.555$  Using Equation 0  
 $FM$   
 $v_{12} = v_F (P_{FM}) = 3388$  pc/h

# Capacity Checks

	Actual	Maximum	LOS F?
$v_{FO}$	9559	6750	Yes
$v_3$ or $v_{av34}$	2716 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?		Yes	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		Yes	
If yes, $v_{12A} = 3488$		(Equation 13-15, 13-16, 13-18, or 13-19)	

# Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
$v_{12A}$	9559	4600	Yes

# Level of Service Determination (if not F)

Density,  $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 34.2$  pc/mi/ln  
 Level of service for ramp-freeway junction areas of influence F

# Speed Estimation

Intermediate speed variable,	$M_S = 4.019$	
Space mean speed in ramp influence area,	$S_R = 2.8$	mph
Space mean speed in outer lanes,	$S_0 = 46.6$	mph
Space mean speed for all vehicles,	$S = 3.7$	mph



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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 NB  
Junction: I-85SB to I-385NB  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4490	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	55.0	mph
Volume on ramp	2006	vph
Length of first accel/decel lane	550	ft
Length of second accel/decel lane	1500	ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1070	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2000	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4490	2006	1070	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1247	557	297	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5438	2429	1296	pcph

#### Estimation of V12 Merge Areas

L = (Equation 13-6 or 13-7)

EQ

P = 0.555 Using Equation 0

FM

$v_{12} = v_F (P_{FM}) = 3018$  pc/h

12 F FM

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{FO}$	7867	6750	Yes
$v_3$ or $v_{av34}$	2420 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		Yes	
If yes, $v_{12A} = 3107$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
$v_{12A}$	7867	4600	Yes

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

Density,  $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 31.2$  pc/mi/ln

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

#### Speed Estimation

Intermediate speed variable,	M = 1.024	
Space mean speed in ramp influence area,	$S_R = 41.7$	mph
Space mean speed in outer lanes,	$S_0 = 48.3$	mph
Space mean speed for all vehicles,	$S = 43.4$	mph

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 NB  
Junction: I-85NB to I-385NB  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	6496	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	1070	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	2006	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2000	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6496	1070	2006	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1804	297	557	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	7867	1296	2429	pcph

#### Estimation of V12 Merge Areas

$$L = \text{(Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.056 \quad \text{Using Equation 4}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 439 \quad \text{pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
v <sub>FO</sub>	9163	9000	Yes
v <sub>3</sub> or v <sub>av34</sub>	3714 pc/h	(Equation 13-14 or 13-17)	
Is v <sub>3</sub> or v <sub>av34</sub> > 2700 pc/h?		Yes	
Is v <sub>3</sub> or v <sub>av34</sub> > 1.5 v <sub>12</sub> / 2		Yes	
If yes, v <sub>12A</sub> = 3146		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v <sub>12A</sub>	9163	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 30.1 \quad \text{pc/mi/ln}$$

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

#### Speed Estimation

Intermediate speed variable,	M <sub>S</sub> = 0.487	
Space mean speed in ramp influence area,	S <sub>R</sub> = 48.7	mph
Space mean speed in outer lanes,	S <sub>0</sub> = 48.1	mph
Space mean speed for all vehicles,	S = 48.4	mph

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 SB  
Junction: I-385SB to I-85  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5597	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	55.0	mph
Volume on ramp	2537	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	0	ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	818	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	Off	
Distance to adjacent ramp	1250	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5597		2537		818	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1555		705		227	v
Trucks and buses	18		18		18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	6779	3073	991	pcph

# Estimation of V12 Diverge Areas

L = (Equation 13-12 or 13-13)

EQ

P = 0.260 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 4037 \text{ pc/h}$

# Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6779	9000	No
$v_{FO} = v_F - v_R$	3706	9000	No
$v_R$	3073	4400	No
$v_3$ or $v_{av34}$	1371 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 4037$		(Equation 13-15, 13-16, 13-18, or 13-19)	

# Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12}$	4037	4400	No

# Level of Service Determination (if not F)

Density,  $D = 4.252 + 0.0086 v_R - 0.009 L_D = 12.0 \text{ pc/mi/ln}$

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

# Speed Estimation

Intermediate speed variable,	$D_S = 0.445$	
Space mean speed in ramp influence area,	$S_R = 49.2$	mph
Space mean speed in outer lanes,	$S_0 = 58.9$	mph
Space mean speed for all vehicles,	$S = 52.7$	mph

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 NB  
Junction: I-85SB to I-385NB  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5358	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	55.0	mph
Volume on ramp	2311	vph
Length of first accel/decel lane	550	ft
Length of second accel/decel lane	1500	ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	649	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2000	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5358	2311	649	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1488	642	180	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	6489	2799	786	pcph

-----Estimation of V12 Merge Areas-----

$$L = \text{(Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.555 \quad \text{Using Equation 0}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3601 \quad \text{pc/h}$$

-----Capacity Checks-----

		Actual	Maximum	LOS F?
v <sub>FO</sub>		9288	6750	Yes
v <sub>3</sub> or v <sub>av34</sub>		2888 pc/h	(Equation 13-14 or 13-17)	
Is v <sub>3</sub> or v <sub>av34</sub>	> 2700 pc/h?		Yes	
Is v <sub>3</sub> or v <sub>av34</sub>	> 1.5 v <sub>12</sub> / 2		Yes	
If yes, v <sub>12A</sub>	= 3708		(Equation 13-15, 13-16, 13-18, or 13-19)	

-----Flow Entering Merge Influence Area-----

	Actual	Max Desirable	Violation?
v <sub>12A</sub>	9288	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 38.6 \quad \text{pc/mi/ln}$$

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

-----Speed Estimation-----

Intermediate speed variable,	M	= 2.647	
Space mean speed in ramp influence area,	S <sub>R</sub>	= 20.6	mph
Space mean speed in outer lanes,	S <sub>0</sub>	= 45.6	mph
Space mean speed for all vehicles,	S	= 24.6	mph



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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 NB  
Junction: I-85NB to I-385NB  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	7669	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	649	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	2311	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2000	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7669	649	2311	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	2130	180	642	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	9288	786	2799	pcph

#### Estimation of V12 Merge Areas

$$L = \text{(Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.120 \quad \text{Using Equation 4}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 1110 \quad \text{pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
v <sub>FO</sub>	10074	9000	Yes
v <sub>3</sub> or v <sub>av34</sub>	4089 pc/h	(Equation 13-14 or 13-17)	
Is v <sub>3</sub> or v <sub>av34</sub> > 2700 pc/h?		Yes	
Is v <sub>3</sub> or v <sub>av34</sub> > 1.5 v <sub>12</sub> / 2		Yes	
If yes, v <sub>12A</sub> = 3715		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v <sub>12A</sub>	10074	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 30.8 \quad \text{pc/mi/ln}$$

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

#### Speed Estimation

Intermediate speed variable,	M <sub>S</sub> = 0.507	
Space mean speed in ramp influence area,	S <sub>R</sub> = 48.4	mph
Space mean speed in outer lanes,	S <sub>0</sub> = 45.6	mph
Space mean speed for all vehicles,	S = 46.8	mph

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 SB  
Junction: I-385SB to I-85  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	9977	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	55.0	mph
Volume on ramp	3625	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	0	ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1312	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	Off	
Distance to adjacent ramp	1250	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	9977	3625	1312	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	2771	1007	364	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	12083	4390	1589	pcph

# Estimation of V12 Diverge Areas

L = (Equation 13-12 or 13-13)

EQ

P = 0.260 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 6390 \text{ pc/h}$

# Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	12083	9000	Yes
$v_{FO} = v_F - v_R$	7693	9000	No
$v_R$	4390	4400	No
$v_3$ or $v_{av34}$	2846 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700 \text{ pc/h?}$		Yes	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 6683$		(Equation 13-15, 13-16, 13-18, or 13-19)	

# Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12A}$	6683	4400	Yes

# Level of Service Determination (if not F)

Density,  $D = 4.252 + 0.0086 v_R - 0.009 L_D = 34.7 \text{ pc/mi/ln}$

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

# Speed Estimation

Intermediate speed variable,	$D_S = 0.563$	
Space mean speed in ramp influence area,	$S_R = 47.7$	mph
Space mean speed in outer lanes,	$S_0 = 53.7$	mph
Space mean speed for all vehicles,	$S = 50.2$	mph

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 NB  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	5	
Free-flow speed on freeway	55.0	mph
Volume on freeway	7566	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	55.0	mph
Volume on ramp	2567	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	1500	ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	727	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1900	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	7566		2567		727	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	2102		713		202	v
Trucks and buses	18		18		18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	9163	3109	880	pcph

# Estimation of V12 Diverge Areas

L = (Equation 13-12 or 13-13)

EQ

P = 0.260 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 4207 \text{ pc/h}$

# Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7331	9000	No
$v_{FO} = v_F - v_R$	4222	9000	No
$v_R$	3109	4400	No
$v_3$ or $v_{av34}$	1562 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 4207$		(Equation 13-15, 13-16, 13-18, or 13-19)	

# Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12}$	4207	4400	No

# Level of Service Determination (if not F)

Density,  $D = 4.252 + 0.0086 v_R - 0.009 L_D = -0.1 \text{ pc/mi/ln}$

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

# Speed Estimation

Intermediate speed variable,	$D_S = 0.448$	
Space mean speed in ramp influence area,	$S_R = 49.2$	mph
Space mean speed in outer lanes,	$S_0 = 58.1$	mph
Space mean speed for all vehicles,	$S = 52.6$	mph

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 NB  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	5	
Free-flow speed on freeway	55.0	mph
Volume on freeway	7566	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	55.0	mph
Volume on ramp	2567	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	1500	ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1070	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	3100	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7566	2567	1070	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	2102	713	297	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	9163	3109	1296	pcph

#### Estimation of V12 Diverge Areas

$$L = \text{(Equation 13-12 or 13-13)}$$

EQ

$$P = 0.260 \quad \text{Using Equation 0}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4207 \quad \text{pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7331	9000	No
$v_{FO} = v_F - v_R$	4222	9000	No
$v_R$	3109	4400	No
$v_3$ or $v_{av34}$	1562 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 4207$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12}$	4207	4400	No

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

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -0.1$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

#### Speed Estimation

Intermediate speed variable,	$D_S = 0.448$	
Space mean speed in ramp influence area,	$S_R = 49.2$	mph
Space mean speed in outer lanes,	$S_0 = 58.1$	mph
Space mean speed for all vehicles,	$S = 52.6$	mph



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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 NB  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4999	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	727	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	2567	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1950	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4999	727	2567	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1389	202	713	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	6054	880	3109	pcph

#### Estimation of V12 Merge Areas

$$L = 2624.48 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.577 \text{ Using Equation 2}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3492 \text{ pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{FO}$	6934	6750	Yes
$v_3$ or $v_{av34}$	2562 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3492$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
$v_{R12}$	6934	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.8 \text{ pc/mi/ln}$$

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

#### Speed Estimation

Intermediate speed variable,	$M_S = 0.465$	
Space mean speed in ramp influence area,	$S_R = 49.0$	mph
Space mean speed in outer lanes,	$S_0 = 46.9$	mph
Space mean speed for all vehicles,	$S = 48.2$	mph

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5543	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	55.0	mph
Volume on ramp	1305	vph
Length of first accel/decel lane	1100	ft
Length of second accel/decel lane		ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1359	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5543	1305	1359	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1540	363	378	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	6713	1581	1646	pcph

#### Estimation of V12 Diverge Areas

$$L = \text{(Equation 13-12 or 13-13)}$$

EQ

$$P = 0.519 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4247 \quad \text{pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6713	6750	No
$v_{FO} = v_F - v_R$	5132	6750	No
$v_R$	1581	2200	No
$v_3$ or $v_{av34}$	2466 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 4247$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12}$	4247	4400	No

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

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 30.9$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence D			

#### Speed Estimation

Intermediate speed variable,	$D_S = 0.310$	
Space mean speed in ramp influence area,	$S_R = 51.0$	mph
Space mean speed in outer lanes,	$S_0 = 54.6$	mph
Space mean speed for all vehicles,	$S = 52.2$	mph

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 SB  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4238	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	1359	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	2537	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1780	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4238	1359	2537	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1177	378	705	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5133	1646	3073	pcph

# Estimation of V12 Merge Areas

L = 11377.27 Equation 13-6 or 13-7)

EQ

P = 1.000 Using Equation 3

FM

v = v (P ) = 5133 pc/h

12 F FM

# Capacity Checks

	Actual	Maximum	LOS F?
v	6779	6750	Yes
FO			
v or v	0 pc/h	(Equation 13-14 or 13-17)	
3 av34			
Is v or v	> 2700 pc/h?	No	
3 av34			
Is v or v	> 1.5 v /2	No	
3 av34	12		
If yes, v	= 5133	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

# Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v	6779	4600	Yes
R12			

# Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 48.2 pc/mi/ln

R R 12 A

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

# Speed Estimation

Intermediate speed variable,	M = 3.585	
	S	
Space mean speed in ramp influence area,	S = 8.4	mph
	R	
Space mean speed in outer lanes,	S = 55.0	mph
	0	
Space mean speed for all vehicles,	S = 8.4	mph

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: AM  
Freeway/Dir of Travel: I-385 SB  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4238	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	1359	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1305	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2220	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4238	1359	1305	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1177	378	363	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5133	1646	1581	pcph

#### Estimation of V12 Merge Areas

$$L = 2591.31 \text{ (Equation 13-6 or 13-7)}$$

EQ

$$P = 0.596 \text{ Using Equation 2}$$

FM

$$v_{12} = v_F (P_{FM}) = 3059 \text{ pc/h}$$

12 F FM

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{FO}$	6779	6750	Yes
$v_3$ or $v_{av34}$	2074 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3059$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
$v_{R12}$	6779	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 32.0 \text{ pc/mi/ln}$$

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

#### Speed Estimation

Intermediate speed variable,	$M_S = 0.587$	
Space mean speed in ramp influence area,	$S_R = 47.4$	mph
Space mean speed in outer lanes,	$S_0 = 49.3$	mph
Space mean speed for all vehicles,	$S = 48.0$	mph



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### Diverge Analysis

Analyst: JP  
 Agency/Co.: Florence & Hutcheson  
 Date performed: 8/25/2011  
 Analysis time period: PM  
 Freeway/Dir of Travel: I-385 NB  
 Junction: Roper Mtn Rd  
 Jurisdiction: Greenville, SC  
 Analysis Year: 2035  
 Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	5	
Free-flow speed on freeway	55.0	mph
Volume on freeway	8318	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	55.0	mph
Volume on ramp	1444	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	1500	ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1329	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1900	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	8318	1444	1329	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	2311	401	369	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	10074	1749	1610	pcph

#### Estimation of V12 Diverge Areas

$$L = \text{(Equation 13-12 or 13-13)}$$

EQ

$$P = 0.260 \quad \text{Using Equation 0}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 3390 \quad \text{pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	8060	9000	No
$v_{FO} = v_F - v_R$	6311	9000	No
$v_R$	1749	4400	No
$v_3$ or $v_{av34}$	2335 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3390$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12}$	3390	4400	No

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

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -7.1$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

#### Speed Estimation

Intermediate speed variable,	$D_S = 0.325$	
Space mean speed in ramp influence area,	$S_R = 50.8$	mph
Space mean speed in outer lanes,	$S_0 = 55.1$	mph
Space mean speed for all vehicles,	$S = 53.2$	mph

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 NB  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	5	
Free-flow speed on freeway	55.0	mph
Volume on freeway	8318	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	55.0	mph
Volume on ramp	1444	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	1500	ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	649	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	3100	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	8318		1444		649	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	2311		401		180	v
Trucks and buses	18		18		18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	10074	1749	786	pcph

#### Estimation of V12 Diverge Areas

L = (Equation 13-12 or 13-13)

EQ

P = 0.260 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 3390 \text{ pc/h}$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	8060	9000	No
$v_{FO} = v_F - v_R$	6311	9000	No
$v_R$	1749	4400	No
$v_3$ or $v_{av34}$	2335 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 3390$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12}$	3390	4400	No

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

Density,  $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = -7.1 \text{ pc/mi/ln}$

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

#### Speed Estimation

Intermediate speed variable,	$D_S = 0.325$	
Space mean speed in ramp influence area,	$S_R = 50.8$	mph
Space mean speed in outer lanes,	$S_0 = 55.1$	mph
Space mean speed for all vehicles,	$S = 53.2$	mph

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 NB  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	6874	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	1329	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1444	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1950	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6874	1329	1444	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1909	369	401	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	8325	1610	1749	pcph

#### Estimation of V12 Merge Areas

$$L = 3266.69 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.536 \text{ Using Equation 2}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 4465 \text{ pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{FO}$	9935	6750	Yes
$v_3$ or $v_{av34}$	3860 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700 \text{ pc/h?}$		Yes	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 5625$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
$v_{12A}$	9935	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 51.8 \text{ pc/mi/ln}$$

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

#### Speed Estimation

Intermediate speed variable,	$M_S = 5.566$	
Space mean speed in ramp influence area,	$S_R = -17.4$	mph
Space mean speed in outer lanes,	$S_0 = 46.1$	mph
Space mean speed for all vehicles,	$S =$	mph

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### Diverge Analysis

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	8498	vph

### Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	55.0	mph
Volume on ramp	1414	vph
Length of first accel/decel lane	1100	ft
Length of second accel/decel lane		ft

### Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	2893	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

### Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	8498	1414	2893	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	2361	393	804	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	10292	1713	3504	pcph

#### Estimation of V12 Diverge Areas

$$L = \text{(Equation 13-12 or 13-13)}$$

$$EQ$$

$$P = 0.424 \quad \text{Using Equation 5}$$

$$FD$$

$$v_{12} = v_R + (v_F - v_R) P = 5350 \quad \text{pc/h}$$

#### Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	10292	6750	Yes
$v_{FO} = v_F - v_R$	8579	6750	Yes
$v_R$	1713	2200	No
$v_3$ or $v_{av34}$	4942 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700$ pc/h?		Yes	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 7592$		(Equation 13-15, 13-16, 13-18, or 13-19)	

#### Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
$v_{12A}$	7592	4400	Yes

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

$$\text{Density, } D = 4.252 + 0.0086 v_R - 0.009 \frac{L}{D} = 59.6 \quad \text{pc/mi/ln}$$

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

#### Speed Estimation

Intermediate speed variable,	$D_S = 0.322$	
Space mean speed in ramp influence area,	$S_R = 50.8$	mph
Space mean speed in outer lanes,	$S_0 = 53.7$	mph
Space mean speed for all vehicles,	$S = 51.5$	mph



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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 SB  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	7084	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	2893	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	3625	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1780	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7084	2893	3625	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1968	804	1007	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	8580	3504	4390	pcph

-----Estimation of V12 Merge Areas-----

L = 16253.24 Equation 13-6 or 13-7)  
 EQ  
 P = 1.000 Using Equation 3  
 FM  
 $v_{12} = v_F (P_{FM}) = 8580 \text{ pc/h}$

-----Capacity Checks-----

	Actual	Maximum	LOS F?
$v_{FO}$	12084	6750	Yes
$v_3$ or $v_{av34}$	0 pc/h	(Equation 13-14 or 13-17)	
Is $v_3$ or $v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3$ or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 8580$		(Equation 13-15, 13-16, 13-18, or 13-19)	

-----Flow Entering Merge Influence Area-----

	Actual	Max Desirable	Violation?
$v_{R12}$	12084	4600	Yes

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

Density,  $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 88.7 \text{ pc/mi/ln}$   
 Level of service for ramp-freeway junction areas of influence F

-----Speed Estimation-----

Intermediate speed variable,	$M_S = 690.522$
Space mean speed in ramp influence area,	$S_R = -8921.8 \text{ mph}$
Space mean speed in outer lanes,	$S_0 = 55.0 \text{ mph}$
Space mean speed for all vehicles,	$S = \text{mph}$

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### \_\_\_\_\_Merge Analysis\_\_\_\_\_

Analyst: JP  
Agency/Co.: Florence & Hutcheson  
Date performed: 8/25/2011  
Analysis time period: PM  
Freeway/Dir of Travel: I-385 SB  
Junction: Roper Mtn Rd  
Jurisdiction: Greenville, SC  
Analysis Year: 2035  
Description: I-85/I-385 Alternate 4A

### \_\_\_\_\_Freeway Data\_\_\_\_\_

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	7084	vph

### \_\_\_\_\_On Ramp Data\_\_\_\_\_

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	55.0	mph
Volume on ramp	2893	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

### \_\_\_\_\_Adjacent Ramp Data (if one exists)\_\_\_\_\_

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1414	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2220	ft

### \_\_\_\_\_Conversion to pc/h Under Base Conditions\_\_\_\_\_

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	7084	2893	1414	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1968	804	393	v
Trucks and buses	18	18	18	%
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	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	8580	3504	1713	pcph

-----Estimation of V12 Merge Areas-----

$$L = 3726.58 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.524 \text{ Using Equation 2}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 4499 \text{ pc/h}$$

-----Capacity Checks-----

	Actual	Maximum	LOS F?
v <sub>FO</sub>	12084	6900	Yes
v <sub>3</sub> or v <sub>av34</sub>	4081 pc/h	(Equation 13-14 or 13-17)	
Is v <sub>3</sub> or v <sub>av34</sub> > 2700 pc/h?		Yes	
Is v <sub>3</sub> or v <sub>av34</sub> > 1.5 v <sub>12</sub> / 2		No	
If yes, v <sub>12A</sub> = 5880		(Equation 13-15, 13-16, 13-18, or 13-19)	

-----Flow Entering Merge Influence Area-----

	Actual	Max Desirable	Violation?
v <sub>12A</sub>	12084	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 67.7 \text{ pc/mi/ln}$$

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

-----Speed Estimation-----

Intermediate speed variable,	M	= 46.552	
Space mean speed in ramp influence area,	S <sub>R</sub>	= -777.9	mph
Space mean speed in outer lanes,	S <sub>0</sub>	= 51.1	mph
Space mean speed for all vehicles,	S	= 296.1	mph