

Florence & Hutcheson
501 Huger Street
Columbia, SC 29201

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 4/19/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Butler Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3299	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	289	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	831	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)	3299		289		831	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	916		80		231	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	3995	350	1006	pcph

Estimation of V12 Diverge Areas

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FD$$

$$v_{12} = v_R + (v_F - v_R) P = 3995 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3995	4600	No
$v_{FO} = v_F - v_R$	3645	4600	No
v_R	350	2100	No
v_3 or v_{av34}	0 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, $v_{12A} = 3995$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3995	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 25.1$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence C			

Speed Estimation

Intermediate speed variable,	$D = 0.329$	
Space mean speed in ramp influence area,	$S_R = 54.1$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 54.1$	mph

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_____Merge Analysis_____

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Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Butler Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3010	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	831	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	289	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)	3010	831	289	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	836	231	80	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	3645	1006	350	pcph

Estimation of V12 Merge Areas

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

EQ

P = 1.000 Using Equation 0

FM

v = v (P) = 3645 pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	4651	4600	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	= 3645	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v	4651	4600	Yes
R12			

Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 34.4 pc/mi/ln

R R 12 A

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

Speed Estimation

Intermediate speed variable,	M = 0.630	
	S	
Space mean speed in ramp influence area,	S = 48.7	mph
	R	
Space mean speed in outer lanes,	S = N/A	mph
	0	
Space mean speed for all vehicles,	S = 48.7	mph

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Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2187	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	721	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	219	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)	2187		721		219	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	608		200		61	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	2649	873	265	pcph

Estimation of V12 Diverge Areas

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FD$$

$$v_{12} = v_R + (v_F - v_R) P = 2649 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2649	4600	No
$v_{FO} = v_F - v_R$	1776	4600	No
v_R	873	2100	No
v_3 or v_{av34}	0 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, $v_{12A} = 2649$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2649	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 18.0$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence B			

Speed Estimation

Intermediate speed variable,	$D_S = 0.377$	
Space mean speed in ramp influence area,	$S_R = 53.2$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 53.2$	mph

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_____Merge Analysis_____

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Freeway/Dir of Travel: I-385 SB
Junction: Butler Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1466	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	219	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	721	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)	1466	219	721	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	407	61	200	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	1775	265	873	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P) = 1775 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		2040	4600	No
v ₃ or v _{av34}	0	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} = 1775			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	2040	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 11.9 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.216	
Space mean speed in ramp influence area,	S _R	= 56.1	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 56.1	mph

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Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Butler Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3709	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	236	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	921	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)	3709	236	921	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1030	66	256	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	4492	286	1115	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 1.000 \quad \text{Using Equation } 0$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4492 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4492	4600	No
$v_{FO} = v_F - v_R$	4206	4600	No
v_R	286	2100	No
v_3 or v_{av34}	0 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, $v_{12A} = 4492$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4492	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 29.4$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence D			

Speed Estimation

Intermediate speed variable,	$D_S = 0.324$	
Space mean speed in ramp influence area,	$S_R = 54.2$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 54.2$	mph

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_____Merge Analysis_____

Analyst: NJ
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Date performed: 4/19/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Butler Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3473	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	921	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	236	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)	3473	921	236	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	965	256	66	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	4206	1115	286	pcph

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

$L =$ (Equation 13-6 or 13-7)
EQ
 $P = 1.000$ Using Equation 0
FM
 $v_{12} = v_F (P_{FM}) = 4206$ pc/h

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

	Actual	Maximum	LOS F?
v_{FO}	5321	4600	Yes
v_3 or v_{av34}	0 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, $v_{12A} = 4206$		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v_{R12}	5321	4600	Yes

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

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 39.6$ pc/mi/ln
Level of service for ramp-freeway junction areas of influence F

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

Intermediate speed variable,	$M_S = 1.020$	
Space mean speed in ramp influence area,	$S_R = 41.6$	mph
Space mean speed in outer lanes,	$S_0 = N/A$	mph
Space mean speed for all vehicles,	$S = 41.6$	mph

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Freeway/Dir of Travel: I-385 SB
Junction: Butler Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4443	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	747	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	416	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)	4443	747	416	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1234	208	116	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	5381	905	504	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 1.000 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P = 5381$ pc/h

Capacity Checks

		Actual	Maximum	LOS F?
$v_{Fi} = v_F$		5381	4600	Yes
$v_{FO} = v_F - v_R$		4476	4600	No
v_R		905	2100	No
v_3 or v_{av34}	0 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, $v_{12A} = 5381$			(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	5381	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$		41.5	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F				

Speed Estimation

Intermediate speed variable,	$D_S = 0.379$		
Space mean speed in ramp influence area,	$S_R = 53.2$	mph	
Space mean speed in outer lanes,	$S_0 = N/A$	mph	
Space mean speed for all vehicles,	$S = 53.2$	mph	

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_____Merge Analysis_____

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Date performed: 4/19/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Butler Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3696	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	416	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	747	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)	3696	416	747	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1027	116	208	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	4476	504	905	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P) = 4476 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		4980	4600	Yes
v ₃ or v _{av34}	0	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} = 4476			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	4980	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 34.7 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.753	
Space mean speed in ramp influence area,	S _R	= 46.4	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 46.4	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3841	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	695	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	1083	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3841	695	1083	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1067	193	301	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	4652	842	1312	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 1.000 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 4652 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4652	4600	Yes
$v_{FO} = v_F - v_R$	3810	4600	No
v_R	842	2100	No
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, $v_{12A} = 4652$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4652	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 30.8 \text{ pc/mi/ln}$
Level of service for ramp-freeway junction areas of influence F		

Speed Estimation

Intermediate speed variable,	$D_S = 0.374$	
Space mean speed in ramp influence area,	$S_R = 53.3$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 53.3$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3146	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	1083	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	966	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1240	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3146	1083	966	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	874	301	268	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	3810	1312	1170	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P) = 3810 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		5122	4600	Yes
v ₃ or v _{av34}	0	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} = 3810			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5122	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 37.9 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.876	
Space mean speed in ramp influence area,	S _R	= 44.2	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 44.2	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3146	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	1083	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	695	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2860	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3146	1083	695	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	874	301	193	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	3810	1312	842	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P) = 3810 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		5122	4600	Yes
v ₃ or v _{av34}	0	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} = 3810			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5122	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 37.9 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.876	
Space mean speed in ramp influence area,	S _R	= 44.2	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 44.2	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3184	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	1187	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	190	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	3400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3184		1187		190	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	884		330		53	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	3856	1438	230	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.597 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2883 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3856	6900	No
$v_{FO} = v_F - v_R$	2418	6900	No
v_R	1438	2100	No
v_3 or v_{av34}	973 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, $v_{12A} = 2883$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2883	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 \frac{L}{D}$	$= 20.0 +$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence C			

Speed Estimation

Intermediate speed variable,	$D_S = 0.427$	
Space mean speed in ramp influence area,	$S_R = 52.3$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 55.2$	mph

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-----Diverge Analysis-----

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

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

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3184	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	1187	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	465	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	910	ft

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

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3184		1187		465	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	884		330		129	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	3856	1438	563	pcph

Estimation of V12 Diverge Areas

$$L = 11170.63 \text{ Equation 13-12 or 13-13}$$

$$EQ$$

$$P = 0.940 \text{ Using Equation 6}$$

$$FD$$

$$v_{12} = v_R + (v_F - v_R) P = 3712 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3856	6900	No
$v_{FO} = v_F - v_R$	2418	6900	No
v_R	1438	2100	No
v_3 or v_{av34}	144 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, $v_{12A} = 3712$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3712	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_R - 0.009 L_D = 27.2 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.427$	
Space mean speed in ramp influence area,	$S_R = 52.3$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 52.7$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1997	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	190	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	1187	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	3000	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1997	190	1187	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	555	53	330	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	2419	230	1438	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P) = 2419 \quad \text{pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	2649	4600	No
v ₃ or v _{av34}	0 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} = 2419		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	2649	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 16.6 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M = 0.241	
Space mean speed in ramp influence area,	S _R = 55.7	mph
Space mean speed in outer lanes,	S ₀ = N/A	mph
Space mean speed for all vehicles,	S = 55.7	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4394	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	706	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	1002	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2900	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4394		706		1002	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1221		196		278	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	5322	855	1214	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 1.000 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P = 5322$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5322	4600	Yes
$v_{FO} = v_F - v_R$	4467	4600	No
v_R	855	2100	No
v_3 or v_{av34}	0 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, $v_{12A} = 5322$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	5322	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	= 36.5	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

Speed Estimation

Intermediate speed variable,	$D_S = 0.375$	
Space mean speed in ramp influence area,	$S_R = 53.3$	mph
Space mean speed in outer lanes,	$S_0 = N/A$	mph
Space mean speed for all vehicles,	$S = 53.3$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3688	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	1002	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	1049	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1240	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3688	1002	1049	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1024	278	291	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	4467	1214	1270	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation 0}$$

$$FM$$

$$v_{12} = v_F(P) = 4467 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5681	4600	Yes
v_3 or v_{av34}	0 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, $v_{12A} = 4467$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5681	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 42.3 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 1.366$	
Space mean speed in ramp influence area,	$S_R = 35.4$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 35.4$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3688	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	1002	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	706	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2860	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3688	1002	706	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1024	278	196	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	4467	1214	855	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P) = 4467 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		5681	4600	Yes
v ₃ or v _{av34}	0	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} = 4467			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5681	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 42.3 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 1.366	
Space mean speed in ramp influence area,	S _R	= 35.4	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 35.4	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4808	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	920	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	555	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	3400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4808	920	555	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1336	256	154	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	5823	1114	672	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.563 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3766$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5823	6900	No
$v_{FO} = v_F - v_R$	4709	6900	No
v_R	1114	2100	No
v_3 or v_{av34}	2057 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, $v_{12A} = 3766$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3766	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 27.6$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.398$	
Space mean speed in ramp influence area,	$S_R = 52.8$	mph
Space mean speed in outer lanes,	$S_0 = 61.7$	mph
Space mean speed for all vehicles,	$S = 55.7$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4808	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	920	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	879	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	910	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4808	920	879	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1336	256	244	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	5823	1114	1065	pcph

Estimation of V12 Diverge Areas

$$L = 8855.44 \text{ (Equation 13-12 or 13-13)}$$

EQ

$$P = 1.000 \text{ Using Equation 6}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 5823 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5823	6900	No
$v_{FO} = v_F - v_R$	4709	6900	No
v_R	1114	2100	No
$v_3 \text{ or } v_{av34}$	0 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, $v_{12A} = 5823$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	5823	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 45.3$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence E			

Speed Estimation

Intermediate speed variable,	$D_S = 0.398$	
Space mean speed in ramp influence area,	$S_R = 52.8$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 52.8$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3888	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	555	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	920	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	3000	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3888	555	920	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1080	154	256	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	4709	672	1114	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation 0}$$

$$FM$$

$$v_{12} = v_F(P) = 4709 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		5381	4600	Yes
v ₃ or v _{av34}	0	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} = 4709			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5381	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 37.7 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 1.033	
Space mean speed in ramp influence area,	S _R	= 41.4	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 41.4	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 nb off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4229	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	966	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	853	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	Off	
Distance to adjacent ramp	1800	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4229	966	853	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1175	268	237	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	5122	1170	1033	pcph

Estimation of V12 Diverge Areas

$$L = 1865.29 \text{ (Equation 13-12 or 13-13)}$$

EQ

$$P = 0.580 \text{ Using Equation 7}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 3461 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5122	6900	No
$v_{FO} = v_F - v_R$	3952	6900	No
v_R	1170	2100	No
v_3 or v_{av34}	1661 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, $v_{12A} = 3461$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3461	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 25.0$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence C			

Speed Estimation

Intermediate speed variable,	$D_S = 0.468$	
Space mean speed in ramp influence area,	$S_R = 51.6$	mph
Space mean speed in outer lanes,	$S_0 = 63.2$	mph
Space mean speed for all vehicles,	$S = 54.9$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 nb off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4229	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	966	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	1083	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1100	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4229		966		1083	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1175		268		301	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	5122	1170	1312	pcph

Estimation of V12 Diverge Areas

L = 13134.97 Equation 13-12 or 13-13)

EQ

P = 1.000 Using Equation 6

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 5122 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5122	6900	No
$v_{FO} = v_F - v_R$	3952	6900	No
v_R	1170	2100	No
$v_3 \text{ or } v_{av34}$	0 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, $v_{12A} = 5122$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	5122	4400	Yes

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 39.3 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.468$	
Space mean speed in ramp influence area,	$S_R = 51.6$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 51.6$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 sb off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3263	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	853	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1654	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3263		853		1654	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	906		237		459	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	3952	1033	2003	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 1.000 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 3952 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3952	4600	No
$v_{FO} = v_F - v_R$	2919	4600	No
v_R	1033	1900	No
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, $v_{12A} = 3952$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3952	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	= 29.8	pc/mi/ln
Level of service for ramp-freeway junction areas of influence D			

Speed Estimation

Intermediate speed variable,	$D_S = 0.651$	
Space mean speed in ramp influence area,	$S_R = 48.3$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 48.3$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 sb off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3263	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	853	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	966	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	Off	
Distance to adjacent ramp	1800	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3263		853		966	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	906		237		268	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	3952	1033	1170	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 1.000 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 3952 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3952	4600	No
$v_{FO} = v_F - v_R$	2919	4600	No
v_R	1033	1900	No
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, $v_{12A} = 3952$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3952	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 \frac{L}{D}$	$= 29.8 \text{ pc/mi/ln}$
Level of service for ramp-freeway junction areas of influence D		

Speed Estimation

Intermediate speed variable,	$D_S = 0.651$	
Space mean speed in ramp influence area,	$S_R = 48.3$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 48.3$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2410	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	1654	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	1350	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	3100	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2410	1654	1350	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	669	459	375	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	2919	2003	1635	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation 0}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2919 \quad \text{pc/h}$$

Capacity Checks

		Actual	Maximum	LOS F?
v _{FO}		4922	4600	Yes
v ₃ or v _{av34}	0	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} = 2919			(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v _{R12}	4922	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 14.7 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	M	= 0.361	
Space mean speed in ramp influence area,	S _R	= 53.5	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 53.5	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2410	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	1654	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	853	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1600	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2410	1654	853	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	669	459	237	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	2919	2003	1033	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2919 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4922	4600	Yes
v_3 or v_{av34}	0 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, $v_{12A} = 2919$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4922	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 14.7 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.361$	
Space mean speed in ramp influence area,	$S_R = 53.5$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 53.5$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I85 off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3028	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	1416	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	1107	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)	3028	1416	1107	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	841	393	308	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	3667	1715	1341	pcph

Estimation of V12 Diverge Areas

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

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2223 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3667	9200	No
$v_{FO} = v_F - v_R$	1952	9200	No
v_R	1715	4400	No
v_3 or v_{av34}	722 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, $v_{12A} = 2223$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2223	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -17.1$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.322$	
Space mean speed in ramp influence area,	$S_R = 54.2$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 58.2$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85 off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3028	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	1416	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	715	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1600	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3028		1416		715	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	841		393		199	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	3667	1715	866	pcph

Estimation of V12 Diverge Areas

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

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2223 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3667	9200	No
$v_{FO} = v_F - v_R$	1952	9200	No
v_R	1715	4400	No
v_3 or v_{av34}	722 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, $v_{12A} = 2223$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2223	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -17.1$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.322$	
Space mean speed in ramp influence area,	$S_R = 54.2$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 58.2$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85 sb on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1612	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	1107	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	465	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)	1612	1107	465	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	448	308	129	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	1952	1341	563	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation 0}$$

$$FM$$

$$v_{12} = v_F(P) = 1952 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3293	4600	No
v_3 or v_{av34}	0 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, $v_{12A} = 1952$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3293	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 23.6 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.360$	
Space mean speed in ramp influence area,	$S_R = 53.5$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 53.5$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85 sb on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1612	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	1107	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	1416	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2300	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1612	1107	1416	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	448	308	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	1952	1341	1715	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P) = 1952 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		3293	4600	No
v ₃ or v _{av34}	0	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} = 1952			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	3293	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 23.6 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.360	
Space mean speed in ramp influence area,	S _R	= 53.5	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 53.5	mph

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

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

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

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2719	vph

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

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	465	vph
Length of first accel/decel lane	920	ft
Length of second accel/decel lane		ft

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

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1187	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	920	ft

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

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2719	465	1187	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	755	129	330	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	3293	563	1438	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P) = 3293 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		3856	4500	No
v ₃ or v _{av34}	0	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} = 3293			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	3856	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.5 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.450	
Space mean speed in ramp influence area,	S _R	= 49.1	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 49.1	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85 nb on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2719	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	465	vph
Length of first accel/decel lane	920	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1107	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2900	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2719	465	1107	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	755	129	308	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	3293	563	1341	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P) = 3293 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		3856	4600	No
v ₃ or v _{av34}	0	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} = 3293			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	3856	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.5 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.450	
Space mean speed in ramp influence area,	S _R	= 51.9	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 51.9	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 nb off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4690	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	1049	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	787	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	Off	
Distance to adjacent ramp	1800	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4690	1049	787	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1303	291	219	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	5680	1270	953	pcph

Estimation of V12 Diverge Areas

$$L = 1909.88 \text{ (Equation 13-12 or 13-13)}$$

EQ

$$P = 0.562 \text{ Using Equation 7}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 3750 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5680	6900	No
$v_{FO} = v_F - v_R$	4410	6900	No
v_R	1270	2100	No
v_3 or v_{av34}	1930 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, $v_{12A} = 3750$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3750	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 27.5$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence C			

Speed Estimation

Intermediate speed variable,	$D_S = 0.477$	
Space mean speed in ramp influence area,	$S_R = 51.4$	mph
Space mean speed in outer lanes,	$S_0 = 62.2$	mph
Space mean speed for all vehicles,	$S = 54.6$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 nb off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4690	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	1049	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	1002	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1100	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4690	1049	1002	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1303	291	278	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	5680	1270	1214	pcph

Estimation of V12 Diverge Areas

$$L = 11548.71 \text{ Equation 13-12 or 13-13}$$

EQ

$$P = 1.000 \text{ Using Equation 6}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 5680 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5680	6900	No
$v_{FO} = v_F - v_R$	4410	6900	No
v_R	1270	2100	No
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, $v_{12A} = 5680$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	5680	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 44.1$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence E			

Speed Estimation

Intermediate speed variable,	$D_S = 0.477$	
Space mean speed in ramp influence area,	$S_R = 51.4$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 51.4$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 sb off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3641	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	787	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1629	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3641	787	1629	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1011	219	453	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	4410	953	1973	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 1.000 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 4410 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4410	4600	No
$v_{FO} = v_F - v_R$	3457	4600	No
v_R	953	1900	No
$v_3 \text{ or } v_{av34}$	0 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, $v_{12A} = 4410$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4410	4400	Yes

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 33.7 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.644$	
Space mean speed in ramp influence area,	$S_R = 48.4$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 48.4$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 sb off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3641	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	787	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1049	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	Off	
Distance to adjacent ramp	1800	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3641	787	1049	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1011	219	291	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	4410	953	1270	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 1.000 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 4410 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4410	4600	No
$v_{FO} = v_F - v_R$	3457	4600	No
v_R	953	1900	No
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, $v_{12A} = 4410$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4410	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 \frac{L}{D}$	$= 33.7 \text{ pc/mi/ln}$
Level of service for ramp-freeway junction areas of influence D		

Speed Estimation

Intermediate speed variable,	$D_S = 0.644$	
Space mean speed in ramp influence area,	$S_R = 48.4$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 48.4$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2854	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	1629	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	759	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	3100	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2854	1629	759	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	793	453	211	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	3457	1973	919	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation 0}$$

$$FM$$

$$v_{12} = v_F(P) = 3457 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5430	4600	Yes
v_3 or v_{av34}	0 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, $v_{12A} = 3457$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5430	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 18.7 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.716$	
Space mean speed in ramp influence area,	$S_R = 47.1$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 47.1$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85 on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2854	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	1629	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	787	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1600	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2854	1629	787	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	793	453	219	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	3457	1973	953	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation 0}$$

$$FM$$

$$v_{12} = v_F(P) = 3457 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5430	4600	Yes
v_3 or v_{av34}	0 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, $v_{12A} = 3457$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5430	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 18.7 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.716$	
Space mean speed in ramp influence area,	$S_R = 47.1$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 47.1$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I85 off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5705	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	2421	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	645	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)	5705	2421	645	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1585	673	179	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	6909	2932	781	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.260 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P = 3966$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6909	9200	No
$v_{FO} = v_F - v_R$	3977	9200	No
v_R	2932	4400	No
v_3 or v_{av34}	1471 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, $v_{12A} = 3966$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3966	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = -2.1$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.432$	
Space mean speed in ramp influence area,	$S_R = 52.2$	mph
Space mean speed in outer lanes,	$S_0 = 64.0$	mph
Space mean speed for all vehicles,	$S = 56.7$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85 off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5705	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	2421	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	1522	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1600	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5705	2421	1522	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1585	673	423	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	6909	2932	1843	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.260 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P = 3966$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6909	9200	No
$v_{FO} = v_F - v_R$	3977	9200	No
v_R	2932	4400	No
v_3 or v_{av34}	1471 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, $v_{12A} = 3966$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3966	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = -2.1$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.432$	
Space mean speed in ramp influence area,	$S_R = 52.2$	mph
Space mean speed in outer lanes,	$S_0 = 64.0$	mph
Space mean speed for all vehicles,	$S = 56.7$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85 sb on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3284	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	645	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	879	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)	3284	645	879	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	912	179	244	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	3977	781	1065	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation 0}$$

$$FM$$

$$v_{12} = v_F(P) = 3977 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4758	4600	Yes
v_3 or v_{av34}	0 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, $v_{12A} = 3977$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4758	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 35.3 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.709$	
Space mean speed in ramp influence area,	$S_R = 47.2$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 47.2$	mph

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

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85 sb on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

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

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3284	vph

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

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	645	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	2421	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2300	ft

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

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3284	645	2421	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	912	179	673	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	3977	781	2932	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P_{FM}) = 3977 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		4758	4600	Yes
v ₃ or v _{av34}	0	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} = 3977			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	4758	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 35.3 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.709	
Space mean speed in ramp influence area,	S _R	= 47.2	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 47.2	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3929	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	879	vph
Length of first accel/decel lane	920	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	920	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	920	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3929	879	920	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1091	244	256	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	4758	1065	1114	pcph

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

$L =$ (Equation 13-6 or 13-7)
EQ
 $P = 1.000$ Using Equation 0
FM
 $v_{12} = v_F (P_{FM}) = 4758$ pc/h

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

	Actual	Maximum	LOS F?
v_{FO}	5823	4500	Yes
v_3 or v_{av34}	0 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, $v_{12A} = 4758$		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v_{R12}	5823	4600	Yes

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

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 44.6$ pc/mi/ln
Level of service for ramp-freeway junction areas of influence F

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

Intermediate speed variable,	$M_S = 1.584$	
Space mean speed in ramp influence area,	$S_R = 34.4$	mph
Space mean speed in outer lanes,	$S_0 = N/A$	mph
Space mean speed for all vehicles,	$S = 34.4$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85 nb on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3929	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	879	vph
Length of first accel/decel lane	920	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	645	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2900	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3929	879	645	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1091	244	179	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	4758	1065	781	pcph

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

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

$$EQ$$

$$P = 1.000 \quad \text{Using Equation } 0$$

$$FM$$

$$v_{12} = v_F(P) = 4758 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		5823	4600	Yes
v ₃ or v _{av34}	0	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} = 4758			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5823	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 44.6 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 1.584	
Space mean speed in ramp influence area,	S _R	= 31.5	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 31.5	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4064	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	1350	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	382	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)	4064	1350	382	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1129	375	106	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	4922	1635	463	pcph

Estimation of V12 Diverge Areas

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

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2490 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4922	9200	No
$v_{FO} = v_F - v_R$	3287	9200	No
v_R	1635	4400	No
$v_3 \text{ or } v_{av34}$	1216 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, $v_{12A} = 2490$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2490	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -14.8$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.315$	
Space mean speed in ramp influence area,	$S_R = 54.3$	mph
Space mean speed in outer lanes,	$S_0 = 65.0$	mph
Space mean speed for all vehicles,	$S = 59.1$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4064	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	1350	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	1654	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)	4064		1350		1654	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1129		375		459	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	4922	1635	2003	pcph

Estimation of V12 Diverge Areas

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

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2490 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4922	9200	No
$v_{FO} = v_F - v_R$	3287	9200	No
v_R	1635	4400	No
v_3 or v_{av34}	1216 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, $v_{12A} = 2490$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2490	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -14.8$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.315$	
Space mean speed in ramp influence area,	$S_R = 54.3$	mph
Space mean speed in outer lanes,	$S_0 = 65.0$	mph
Space mean speed for all vehicles,	$S = 59.1$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2714	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	382	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	1350	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)	2714	382	1350	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	754	106	375	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	3287	463	1635	pcph

Estimation of V12 Merge Areas

$$L = 1943.10 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2036 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3750	6900	No
v_3 or v_{av34}	1251 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, $v_{12A} = 2036$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3750	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 15.3 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.203$	
Space mean speed in ramp influence area,	$S_R = 56.3$	mph
Space mean speed in outer lanes,	$S_0 = 57.3$	mph
Space mean speed for all vehicles,	$S = 56.7$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2984	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	671	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	715	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)	2984	671	715	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	829	186	199	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	3614	813	866	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.632 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 2584 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3614	6900	No
$v_{FO} = v_F - v_R$	2801	6900	No
v_R	813	2200	No
v_3 or v_{av34}	1030 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, $v_{12A} = 2584$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2584	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 16.6$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence B			

Speed Estimation

Intermediate speed variable,	$D = 0.241$	
Space mean speed in ramp influence area,	$S_R = 55.7$	mph
Space mean speed in outer lanes,	$S_0 = 65.7$	mph
Space mean speed for all vehicles,	$S = 58.2$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2313	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	715	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	1416	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)	2313	715	1416	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	643	199	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	2801	866	1715	pcph

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

$$L = 6349.50 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.802 \text{ Using Equation 3}$$

$$FM$$

$$v_{12} = v_F(P) = 2246 \text{ pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	3667	6900	No
v ₃ or v _{av34}	555 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} = 2246		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	3667	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 19.9 \text{ pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.244	
	S		
Space mean speed in ramp influence area,	S _R	= 55.6	mph
Space mean speed in outer lanes,	S ₀	= 59.8	mph
Space mean speed for all vehicles,	S	= 56.2	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2313	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	715	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	671	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)	2313	715	671	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	643	199	186	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	2801	866	813	pcph

Estimation of V12 Merge Areas

$$L = 1925.34 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 1735 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3667	6900	No
v_3 or v_{av34}	1066 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, $v_{12A} = 1735$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3667	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 16.0 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.209$	
Space mean speed in ramp influence area,	$S_R = 56.2$	mph
Space mean speed in outer lanes,	$S_0 = 58.0$	mph
Space mean speed for all vehicles,	$S = 56.7$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4483	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	759	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	699	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)	4483		759		699	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1245		211		194	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	5429	919	847	pcph

Estimation of V12 Diverge Areas

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

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2092 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5429	9200	No
$v_{FO} = v_F - v_R$	4510	9200	No
v_R	919	4400	No
v_3 or v_{av34}	1668 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, $v_{12A} = 2171$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12A}	2171	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -17.6$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.251$	
Space mean speed in ramp influence area,	$S_R = 55.5$	mph
Space mean speed in outer lanes,	$S_0 = 63.4$	mph
Space mean speed for all vehicles,	$S = 60.0$	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd off ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4483	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	759	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	1629	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)	4483		759		1629	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1245		211		453	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	5429	919	1973	pcph

Estimation of V12 Diverge Areas

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

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2092 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5429	9200	No
$v_{FO} = v_F - v_R$	4510	9200	No
v_R	919	4400	No
v_3 or v_{av34}	1668 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, $v_{12A} = 2171$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12A}	2171	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -17.6$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.251$	
Space mean speed in ramp influence area,	$S_R = 55.5$	mph
Space mean speed in outer lanes,	$S_0 = 63.4$	mph
Space mean speed for all vehicles,	$S = 60.0$	mph

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

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

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

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3724	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	699	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	759	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)	3724	699	759	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1034	194	211	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	4510	847	919	pcph

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

$$L = 2287.00 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.598 \text{ Using Equation 2}$$

$$FM$$

$$v_{12} = v_F(P) = 2698 \text{ pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	5357	6900	No
v ₃ or v _{av34}	1812 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} = 2698		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5357	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 23.3 \text{ pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.291	
Space mean speed in ramp influence area,	S _R	= 54.8	mph
Space mean speed in outer lanes,	S ₀	= 55.3	mph
Space mean speed for all vehicles,	S	= 54.9	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4836	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	653	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	1522	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)	4836	653	1522	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1343	181	423	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	5857	791	1843	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.577 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 3715 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5857	6900	No
$v_{FO} = v_F - v_R$	5066	6900	No
v_R	791	2200	No
v_3 or v_{av34}	2142 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, $v_{12A} = 3715$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3715	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	= 26.3	pc/mi/ln
Level of service for ramp-freeway junction areas of influence C			

Speed Estimation

Intermediate speed variable,	$D_S = 0.239$	
Space mean speed in ramp influence area,	$S_R = 55.7$	mph
Space mean speed in outer lanes,	$S_0 = 61.4$	mph
Space mean speed for all vehicles,	$S = 57.6$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4183	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	1522	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	2421	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)	4183	1522	2421	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1162	423	673	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	5066	1843	2932	pcph

Estimation of V12 Merge Areas

$L = 10855.24$ Equation 13-6 or 13-7)
 EQ
 $P = 0.982$ Using Equation 3
 FM
 $v_{12} = v_F (P_{FM}) = 4973$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6909	6900	Yes
v_3 or v_{av34}	93 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, $v_{12A} = 4973$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	6909	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 48.4$ pc/mi/ln
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 3.714$	
Space mean speed in ramp influence area,	$S_R = -6.9$	mph
Space mean speed in outer lanes,	$S_0 = 60.0$	mph
Space mean speed for all vehicles,	$S =$	mph

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

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 3/29/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2010
Description: I-85/I-385 Existing

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

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4183	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	1522	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	653	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)	4183	1522	653	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1162	423	181	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	5066	1843	791	pcph

Estimation of V12 Merge Areas

L = 2619.13 (Equation 13-6 or 13-7)

EQ

P = 0.594 Using Equation 2

FM

v = v (P) = 3010 pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	6909	6900	Yes
FO			
v or v	2056 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	= 3010	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v	6909	4600	Yes
R12			

Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 33.1 pc/mi/ln

R R 12 A

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

Speed Estimation

Intermediate speed variable,	M = 0.656	
	S	
Space mean speed in ramp influence area,	S = 48.2	mph
	R	
Space mean speed in outer lanes,	S = 54.4	mph
	0	
Space mean speed for all vehicles,	S = 49.9	mph