

Florence & Hutcheson
501 Huger Street
Columbia, SC 29201

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: US 276 (EXIT48A)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4590	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	276	vph
Length of first accel/decel lane	700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	237	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4590	276	237	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1275	77	66	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	5559	334	287	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.606 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3499$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5559	6900	No
$v_{FO} = v_F - v_R$	5225	6900	No
v_R	334	2000	No
v_3 or v_{av34}	2060 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, $v_{12A} = 3499$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3499	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 28.0+$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.523$	
Space mean speed in ramp influence area,	$S_R = 50.6$	mph
Space mean speed in outer lanes,	$S_0 = 61.7$	mph
Space mean speed for all vehicles,	$S = 54.2$	mph

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

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

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

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4314	vph

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

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	237	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

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

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	627	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	500	ft

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

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4314	237	627	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1198	66	174	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	5225	287	759	pcph

Estimation of V12 Merge Areas

$$L = 4911.35 \text{ (Equation 13-6 or 13-7)}$$

EQ

$$P = 0.948 \text{ Using Equation 3}$$

FM

$$v_{12} = v_F (P_{FM}) = 4951 \text{ pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5512	6900	No
v_3 or v_{av34}	274 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, $v_{12A} = 4951$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5512	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 43.6 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 1.034$	
Space mean speed in ramp influence area,	$S_R = 41.4$	mph
Space mean speed in outer lanes,	$S_0 = 60.0$	mph
Space mean speed for all vehicles,	$S = 42.0$	mph

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Freeway/Dir of Travel: I-85 NB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4314	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	237	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	276	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	500	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4314	237	276	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1198	66	77	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	5225	287	334	pcph

Estimation of V12 Merge Areas

L = 271.05 (Equation 13-6 or 13-7)

EQ

P = 0.589 Using Equation 1

FM

$v_{12} = v_F (P_{FM}) = 3079$ pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5512	6900	No
v_3 or v_{av34}	2146 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, $v_{12A} = 3079$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5512	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.0$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	M = 0.413	
Space mean speed in ramp influence area,	$S_R = 52.6$	mph
Space mean speed in outer lanes,	$S_0 = 54.1$	mph
Space mean speed for all vehicles,	$S = 53.1$	mph

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Freeway/Dir of Travel: I-85 NB
Junction: US 276 (EXIT48B)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4551	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	627	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	547	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	450	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4551	627	547	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1264	174	152	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	5512	759	662	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.587 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3550 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5512	6900	No
$v_{FO} = v_F - v_R$	4753	6900	No
v_R	759	1900	No
v_3 or v_{av34}	1962 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, $v_{12A} = 3550$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3550	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 31.0$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence D			

Speed Estimation

Intermediate speed variable,	$D_S = 0.626$	
Space mean speed in ramp influence area,	$S_R = 48.7$	mph
Space mean speed in outer lanes,	$S_0 = 62.1$	mph
Space mean speed for all vehicles,	$S = 52.8$	mph

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Diverge Analysis

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Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: US 276 (EXIT48B)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4551	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	627	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	237	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	420	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4551	627	237	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1264	174	66	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	5512	759	287	pcph

Estimation of V12 Diverge Areas

$$L = 2048.65 \text{ (Equation 13-12 or 13-13)}$$

EQ

$$P = 0.915 \text{ Using Equation 6}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 5107 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5512	6900	No
$v_{FO} = v_F - v_R$	4753	6900	No
v_R	759	1900	No
v_3 or v_{av34}	405 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, $v_{12A} = 5107$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	5107	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 44.4$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence E			

Speed Estimation

Intermediate speed variable,	$D_S = 0.626$	
Space mean speed in ramp influence area,	$S_R = 48.7$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 49.7$	mph

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_____Merge Analysis_____

Analyst: JP
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Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3924	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	547	vph
Length of first accel/decel lane	550	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	627	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	450	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3924	547	627	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1090	152	174	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	4752	662	759	pcph

Estimation of V12 Merge Areas

$$L = 569.40 \quad (\text{Equation 13-6 or 13-7})$$

EQ

$$P = 0.585 \quad \text{Using Equation 2}$$

FM

$$v_{12} = v_F (P_{FM}) = 2781 \quad \text{pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5414	6900	No
v_3 or v_{av34}	1971 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, $v_{12A} = 2781$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5414	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 28.6 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.410$	
Space mean speed in ramp influence area,	$S_R = 52.6$	mph
Space mean speed in outer lanes,	$S_0 = 54.7$	mph
Space mean speed for all vehicles,	$S = 53.4$	mph

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Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: US 276 (EXIT48B)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4824	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	478	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1135	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4824		478		1135	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1340		133		315	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	5842	579	1375	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.587 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3670 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5842	6900	No
$v_{FO} = v_F - v_R$	5263	6900	No
v_R	579	2000	No
v_3 or v_{av34}	2172 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, $v_{12A} = 3670$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3670	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 30.0$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence D			

Speed Estimation

Intermediate speed variable,	$D = 0.545$	
Space mean speed in ramp influence area,	$S_R = 50.2$	mph
Space mean speed in outer lanes,	$S_0 = 61.2$	mph
Space mean speed for all vehicles,	$S = 53.8$	mph

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_____Merge Analysis_____

Analyst: JP
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Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4346	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	1135	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	758	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	420	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4346	1135	758	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1207	315	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	5263	1375	918	pcph

Estimation of V12 Merge Areas

$L = 5940.21$ (Equation 13-6 or 13-7)
 EQ
 $P = 1.000$ Using Equation 3
 FM
 $v_{12} = v_F (P_{FM}) = 5263$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6638	6900	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, $v_{12A} = 5263$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	6638	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 54.0$ pc/mi/ln
 Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable,	$M_S = 3.278$	
Space mean speed in ramp influence area,	$S_R = 1.0$	mph
Space mean speed in outer lanes,	$S_0 = 60.0$	mph
Space mean speed for all vehicles,	$S = 1.0$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4346	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	1135	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	478	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	500	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4346	1135	478	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1207	315	133	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	5263	1375	579	pcph

Estimation of V12 Merge Areas

$$L = 512.01 \quad (\text{Equation 13-6 or 13-7})$$

$$EQ$$

$$P = 0.588 \quad \text{Using Equation 2}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3097 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6638	6900	No
v_3 or v_{av34}	2166 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, $v_{12A} = 3097$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	6638	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 37.1 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.641$	
Space mean speed in ramp influence area,	$S_R = 48.5$	mph
Space mean speed in outer lanes,	$S_0 = 54.0$	mph
Space mean speed for all vehicles,	$S = 50.1$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: US 276 (EXIT 48A)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5481	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	758	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	462	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	468	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5481		758		462	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1523		211		128	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	6638	918	560	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.552 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 4074 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6638	6900	No
$v_{FO} = v_F - v_R$	5720	6900	No
v_R	918	1900	No
v_3 or v_{av34}	2564 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, $v_{12A} = 4074$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4074	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 35.5$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence E			

Speed Estimation

Intermediate speed variable,	$D = 0.641$	
Space mean speed in ramp influence area,	$S_R = 48.5$	mph
Space mean speed in outer lanes,	$S_0 = 59.7$	mph
Space mean speed for all vehicles,	$S = 52.3$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: US 276 (EXIT 48A)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5481	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	758	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1135	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	420	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5481	758	1135	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1523	211	315	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	6638	918	1375	pcph

Estimation of V12 Diverge Areas

$$L = 8934.02 \text{ (Equation 13-12 or 13-13)}$$

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 6638 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6638	6900	No
$v_{FO} = v_F - v_R$	5720	6900	No
v_R	918	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, $v_{12A} = 6638$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	6638	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 57.6 \text{ pc/mi/ln}$
Level of service for ramp-freeway junction areas of influence E		

Speed Estimation

Intermediate speed variable,	$D_S = 0.641$	
Space mean speed in ramp influence area,	$S_R = 48.5$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 48.5$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4723	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	462	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	758	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	470	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4723	462	758	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1312	128	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	5720	560	918	pcph

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

$$L = 470.92 \quad (\text{Equation 13-6 or 13-7})$$

$$EQ$$

$$P = 0.591 \quad \text{Using Equation 2}$$

$$FM$$

$$v_{12} = v_F(P) = 3382 \quad \text{pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	6280	6900	No
v ₃ or v _{av34}	2338 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} = 3382		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	6280	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 32.8 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M _S = 0.497	
Space mean speed in ramp influence area,	S _R = 51.1	mph
Space mean speed in outer lanes,	S ₀ = 53.2	mph
Space mean speed for all vehicles,	S = 51.8	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: US 276 (EXIT48A)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4760	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	1278	vph
Length of first accel/decel lane	700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	449	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4760	1278	449	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1322	355	125	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	5765	1548	544	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.545 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3845$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5765	6900	No
$v_{FO} = v_F - v_R$	4217	6900	No
v_R	1548	2000	No
v_3 or v_{av34}	1920 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, $v_{12A} = 3845$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3845	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 31.0$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.632$	
Space mean speed in ramp influence area,	$S_R = 48.6$	mph
Space mean speed in outer lanes,	$S_0 = 62.2$	mph
Space mean speed for all vehicles,	$S = 52.4$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3482	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	449	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	385	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	420	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3482	449	385	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	967	125	107	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	4217	544	466	pcph

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

$$L = 3015.40 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.840 \text{ Using Equation 3}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3543 \text{ pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	4761	6900	No
v ₃ or v _{av34}	674 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} = 3543		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	4761	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 34.5 \text{ pc/mi/ln}$$

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

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

Intermediate speed variable,	M _S = 0.532	
Space mean speed in ramp influence area,	S _R = 50.4	mph
Space mean speed in outer lanes,	S ₀ = 59.4	mph
Space mean speed for all vehicles,	S = 51.5	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3482	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	449	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1278	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	500	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3482	449	1278	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	967	125	355	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	4217	544	1548	pcph

Estimation of V12 Merge Areas

$$L = 110.33 \quad (\text{Equation 13-6 or 13-7})$$

$$EQ$$

$$P = 0.589 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2485 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4761	6900	No
v_3 or v_{av34}	1732 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, $v_{12A} = 2485$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4761	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 26.2 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.381$	
Space mean speed in ramp influence area,	$S_R = 53.1$	mph
Space mean speed in outer lanes,	$S_0 = 55.6$	mph
Space mean speed for all vehicles,	$S = 54.0$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 Nb
Junction: US 276 (EXIT48B)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3931	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	385	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	642	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	450	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3931	385	642	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1092	107	178	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	4761	466	778	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.620 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3127$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_F = v_{Fi}$	4761	6900	No
$v_F = v_F - v_R$	4295	6900	No
v_R	466	1900	No
v_3 or v_{av34}	1634 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, $v_{12A} = 3127$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3127	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 27.4$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.600$	
Space mean speed in ramp influence area,	$S_R = 49.2$	mph
Space mean speed in outer lanes,	$S_0 = 63.3$	mph
Space mean speed for all vehicles,	$S = 53.3$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: US 276 (EXIT48B)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3931	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	385	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	449	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	420	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3931	385	449	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1092	107	125	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	4761	466	544	pcph

Estimation of V12 Diverge Areas

$$L = 3749.47 \text{ (Equation 13-12 or 13-13)}$$

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P = 4761 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4761	6900	No
$v_{FO} = v_F - v_R$	4295	6900	No
v_R	466	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, $v_{12A} = 4761$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4761	4400	Yes

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 41.4 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.600$	
Space mean speed in ramp influence area,	$S_R = 49.2$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 49.2$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3546	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	642	vph
Length of first accel/decel lane	550	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	385	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	450	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3546	642	385	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	985	178	107	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	4295	778	466	pcph

Estimation of V12 Merge Areas

$$L = 496.42 \quad (\text{Equation 13-6 or 13-7})$$

EQ

$$P = 0.590 \quad \text{Using Equation 2}$$

FM

$$v_{12} = v_F (P_{FM}) = 2534 \quad \text{pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v _{FO}	5073	6900	No
v ₃ or v _{av34}	1761 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} = 2534		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v _{R12}	5073	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 27.5 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	M	= 0.395	
Space mean speed in ramp influence area,	S _R	= 52.9	mph
Space mean speed in outer lanes,	S ₀	= 55.5	mph
Space mean speed for all vehicles,	S	= 53.8	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: US 276 (EXIT48B)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6247	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	431	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	677	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	6247		431		677	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1735		120		188	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	7566	522	820	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.547 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 4374 \quad \text{pc/h}$$

Capacity Checks

		Actual	Maximum	LOS F?
$v_{Fi} = v_F$		7566	6900	Yes
$v_{FO} = v_F - v_R$		7044	6900	Yes
v_R		522	2000	No
v_3 or v_{av34}		3192 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or $v_{av34} > 2700$ pc/h?			Yes	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$			No	
If yes, $v_{12A} = 4866$			(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12A}	4866	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 40.2$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

Speed Estimation

Intermediate speed variable,	$D = 0.540$	
Space mean speed in ramp influence area,	$S_R = 50.3$	mph
Space mean speed in outer lanes,	$S_0 = 59.2$	mph
Space mean speed for all vehicles,	$S = 53.1$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5816	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	677	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	493	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	420	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5816	677	493	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1616	188	137	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	7044	820	597	pcph

Estimation of V12 Merge Areas

$$L = 3863.08 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.922 \text{ Using Equation 3}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 6496 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7864	6900	Yes
$v_3 \text{ or } v_{av34}$	548 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, $v_{12A} = 6496$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	7864	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 59.5 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 6.166$	
Space mean speed in ramp influence area,	$S_R = -51.0$	mph
Space mean speed in outer lanes,	$S_0 = 59.8$	mph
Space mean speed for all vehicles,	$S =$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5816	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	677	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	431	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	500	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5816	677	431	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1616	188	120	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	7044	820	522	pcph

Estimation of V12 Merge Areas

$$L = 774.38 \quad (\text{Equation 13-6 or 13-7})$$

EQ

$$P = 0.572 \quad \text{Using Equation 2}$$

FM

$$v_{12} = v_F (P_{FM}) = 4028 \quad \text{pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7864	6900	Yes
v_3 or v_{av34}	3016 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or $v_{av34} > 2700$ pc/h?		Yes	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 4344$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{12A}	7864	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$	=	42.7	pc/mi/ln
Level of service for ramp-freeway junction areas of influence	F		

Speed Estimation

Intermediate speed variable,	$M_S = 0.982$	
Space mean speed in ramp influence area,	$S_R = 42.3$	mph
Space mean speed in outer lanes,	$S_0 = 51.1$	mph
Space mean speed for all vehicles,	$S = 45.0$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: US 276 (EXIT 48A)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6493	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	493	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	624	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	468	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	6493		493		624	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1804		137		173	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	7864	597	756	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.536 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 4492$ pc/h

Capacity Checks

		Actual	Maximum	LOS F?
$v_{Fi} = v_F$		7864	6900	Yes
$v_{FO} = v_F - v_R$		7267	6900	Yes
v_R		597	1900	No
v_3 or v_{av34}		3372 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or $v_{av34} > 2700$ pc/h?			Yes	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$			No	
If yes, $v_{12A} = 5164$			(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12A}	5164	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$		44.9	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F				

Speed Estimation

Intermediate speed variable,	$D = 0.612$		
Space mean speed in ramp influence area,	$S_R = 49.0$	mph	
Space mean speed in outer lanes,	$S_0 = 59.2$	mph	
Space mean speed for all vehicles,	$S = 52.1$	mph	

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: US 276 (EXIT 48A)
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6493	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	493	vph
Length of first accel/decel lane	420	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	677	vph
Position of adjacent ramp	Upstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	420	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6493	493	677	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1804	137	188	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	7864	597	820	pcph

Estimation of V12 Diverge Areas

$$L = 3970.94 \text{ (Equation 13-12 or 13-13)}$$

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 7864 \text{ pc/h}$$

Capacity Checks

		Actual	Maximum	LOS F?
$v_{Fi} = v_F$		7864	6900	Yes
$v_{FO} = v_F - v_R$		7267	6900	Yes
v_R		597	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, $v_{12A} = 7864$			(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	7864	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 68.1$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

Speed Estimation

Intermediate speed variable,	$D_S = 0.612$	
Space mean speed in ramp influence area,	$S_R = 49.0$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 49.0$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: US 276
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6000	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	624	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	493	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	470	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6000	624	493	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1667	173	137	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	7267	756	597	pcph

Estimation of V12 Merge Areas

$$L = 843.92 \text{ (Equation 13-6 or 13-7)}$$

EQ

$$P = 0.568 \text{ Using Equation 2}$$

FM

$$v_{12} = v_F (P_{FM}) = 4126 \text{ pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v _{FO}	8023	6900	Yes
v ₃ or v _{av34}	3141 pc/h	(Equation 13-14 or 13-17)	
Is v ₃ or v _{av34} > 2700 pc/h?		Yes	
Is v ₃ or v _{av34} > 1.5 v ₁₂ / 2		No	
If yes, v _{12A} = 4567		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v _{12A}	8023	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 43.5 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable,	M _S = 1.095	
Space mean speed in ramp influence area,	S _R = 40.3	mph
Space mean speed in outer lanes,	S ₀ = 51.1	mph
Space mean speed for all vehicles,	S = 43.4	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: Woodruff Rd.
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4278	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	546	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	1506	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2250	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4278	546	1506	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1188	152	418	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	5181	661	1824	pcph

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

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3210 \quad \text{pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	5842	6900	No
v ₃ or v _{av34}	1971 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} = 3210		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5842	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 26.0 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M _S = 0.373	
Space mean speed in ramp influence area,	S _R = 53.3	mph
Space mean speed in outer lanes,	S ₀ = 54.7	mph
Space mean speed for all vehicles,	S = 53.8	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: Woodruff Rd.
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5322	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	925	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	1490	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2250	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5322	925	1490	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1478	257	414	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	6446	1120	1805	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3993 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7566	6900	Yes
v_3 or v_{av34}	2453 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, $v_{12A} = 3993$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	7566	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 35.4 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.834$	
Space mean speed in ramp influence area,	$S_R = 45.0$	mph
Space mean speed in outer lanes,	$S_0 = 52.6$	mph
Space mean speed for all vehicles,	$S = 47.2$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4471	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	1806	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	389	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	4500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4471		1806		389	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1242		502		108	v
Trucks and buses	18		15		15	%
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	0.930	0.930	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5415	2157	465	pcph

Estimation of V12 Diverge Areas

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

$$EQ$$

$$P = 0.525 \quad \text{Using Equation 5}$$

$$FD$$

$$v_{12} = v_R + (v_F - v_R) P = 3869 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5415	6900	No
$v_{FO} = v_F - v_R$	3258	6900	No
v_R	2157	2100	Yes
v_3 or v_{av34}	1546 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, $v_{12A} = 3869$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3869	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_R - 0.009 \frac{L}{D} = 34.4 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.492$	
Space mean speed in ramp influence area,	$S_R = 51.1$	mph
Space mean speed in outer lanes,	$S_0 = 63.7$	mph
Space mean speed for all vehicles,	$S = 54.2$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2665	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	389	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	2155	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	1060	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2665	389	2155	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	740	108	599	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	3228	471	2610	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 0.596 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 1923 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3699	6900	No
v_3 or v_{av34}	1305 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, $v_{12A} = 1923$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3699	4600	No

Level of Service Determination (if not F)

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

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.305$	
Space mean speed in ramp influence area,	$S_R = 54.5$	mph
Space mean speed in outer lanes,	$S_0 = 57.1$	mph
Space mean speed for all vehicles,	$S = 55.4$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2665	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	389	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1806	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	4500	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2665	389	1806	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	740	108	502	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	3228	471	2187	pcph

Estimation of V12 Merge Areas

L = 1031.59 (Equation 13-6 or 13-7)

EQ

P = 0.596 Using Equation 1

FM

v = v (P) = 1923 pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	3699	6900	No
FO			
v or v	1305 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	= 1923	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v	3699	4600	No
R12			

Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 19.9 pc/mi/ln

R R 12 A

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

Speed Estimation

Intermediate speed variable,	M = 0.305	
	S	
Space mean speed in ramp influence area,	S = 54.5	mph
	R	
Space mean speed in outer lanes,	S = 57.1	mph
	0	
Space mean speed for all vehicles,	S = 55.4	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5805	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	3033	vph
Length of first accel/decel lane	600	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1506	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	5100	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5805	3033	1506	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1613	843	418	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	7031	3673	1824	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.415 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 5067 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7031	6900	Yes
$v_{FO} = v_F - v_R$	3358	6900	No
v_R	3673	2100	Yes
v_3 or v_{av34}	1964 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, $v_{12A} = 5067$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	5067	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 42.4$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

Speed Estimation

Intermediate speed variable,	$D = 0.629$	
Space mean speed in ramp influence area,	$S_R = 48.7$	mph
Space mean speed in outer lanes,	$S_0 = 62.1$	mph
Space mean speed for all vehicles,	$S = 51.8$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2772	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	1506	vph
Length of first accel/decel lane	900	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	546	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2250	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2772	1506	546	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	770	418	152	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	3357	1824	661	pcph

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

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

$$EQ$$

$$P = 0.603 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2023 \quad \text{pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	5181	6900	No
v ₃ or v _{av34}	1334 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} = 2023		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5181	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.0 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M _S = 0.423	
Space mean speed in ramp influence area,	S _R = 52.4	mph
Space mean speed in outer lanes,	S ₀ = 57.0	mph
Space mean speed for all vehicles,	S = 53.5	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2772	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	1506	vph
Length of first accel/decel lane	900	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	3033	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	5100	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2772	1506	3033	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	770	418	843	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	3357	1824	3673	pcph

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

$$L = 1459.73 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.603 \text{ Using Equation 1}$$

$$FM$$

$$v_{12} = v_F(P) = 2023 \text{ pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		5181	6900	No
v ₃ or v _{av34}		1334 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} = 2023			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5181	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 29.0 \text{ pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.423	
Space mean speed in ramp influence area,	S _R	= 52.4	mph
Space mean speed in outer lanes,	S ₀	= 57.0	mph
Space mean speed for all vehicles,	S	= 53.5	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4188	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	1813	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1331	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	4500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4188	1813	1331	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1163	504	370	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	5072	2196	1612	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.532 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3727 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5072	6900	No
$v_{FO} = v_F - v_R$	2876	6900	No
v_R	2196	2100	Yes
v_3 or v_{av34}	1345 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, $v_{12A} = 3727$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3727	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 33.2$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

Speed Estimation

Intermediate speed variable,	$D_S = 0.496$	
Space mean speed in ramp influence area,	$S_R = 51.1$	mph
Space mean speed in outer lanes,	$S_0 = 64.5$	mph
Space mean speed for all vehicles,	$S = 54.1$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2375	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	1331	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	2997	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	1060	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2375	1331	2997	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	660	370	833	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	2876	1612	3630	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 0.596 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 1713 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4488	6900	No
v_3 or v_{av34}	1163 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, $v_{12A} = 1713$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4488	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 26.6 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.371$	
Space mean speed in ramp influence area,	$S_R = 53.3$	mph
Space mean speed in outer lanes,	$S_0 = 57.6$	mph
Space mean speed for all vehicles,	$S = 54.4$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2375	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	1331	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1813	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	4500	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2375	1331	1813	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	660	370	504	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	2876	1612	2196	pcph

Estimation of V12 Merge Areas

$$L = 1200.43 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.596 \text{ Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 1713 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4488	6900	No
v_3 or v_{av34}	1163 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, $v_{12A} = 1713$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4488	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 26.6 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.371$	
Space mean speed in ramp influence area,	$S_R = 53.3$	mph
Space mean speed in outer lanes,	$S_0 = 57.6$	mph
Space mean speed for all vehicles,	$S = 54.4$	mph

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

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

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

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6307	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	2475	vph
Length of first accel/decel lane	600	ft
Length of second accel/decel lane		ft

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

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1490	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	5100	ft

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

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6307	2475	1490	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1752	688	414	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	7638	2998	1805	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.431 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4998 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7638	6900	Yes
$v_{FO} = v_F - v_R$	4640	6900	No
v_R	2998	2100	Yes
$v_3 \text{ or } v_{av34}$	2640 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, $v_{12A} = 4998$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4998	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 41.8$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

Speed Estimation

Intermediate speed variable,	$D_S = 0.568$	
Space mean speed in ramp influence area,	$S_R = 49.8$	mph
Space mean speed in outer lanes,	$S_0 = 59.4$	mph
Space mean speed for all vehicles,	$S = 52.7$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3832	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	1490	vph
Length of first accel/decel lane	900	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	925	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2250	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3832	1490	925	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1064	414	257	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	4641	1805	1120	pcph

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

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

$$EQ$$

$$P = 0.603 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F(P) = 2797 \quad \text{pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	6446	6900	No
v ₃ or v _{av34}	1844 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} = 2797		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	6446	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 34.9 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.629	
Space mean speed in ramp influence area,	S _R	= 48.7	mph
Space mean speed in outer lanes,	S ₀	= 55.2	mph
Space mean speed for all vehicles,	S	= 50.4	mph

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

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 9/30/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: C-D ROAD
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

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

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3832	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	1490	vph
Length of first accel/decel lane	900	ft
Length of second accel/decel lane		ft

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

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	2475	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	5100	ft

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

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3832	1490	2475	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1064	414	688	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	4641	1805	2998	pcph

Estimation of V12 Merge Areas

$$L = 1730.44 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.603 \text{ Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2797 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6446	6900	No
v_3 or v_{av34}	1844 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, $v_{12A} = 2797$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	6446	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 34.9 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.629$	
Space mean speed in ramp influence area,	$S_R = 48.7$	mph
Space mean speed in outer lanes,	$S_0 = 55.2$	mph
Space mean speed for all vehicles,	$S = 50.4$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: I-385
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3054	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	2155	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	389	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	1060	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3054	2155	389	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	848	599	108	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	3699	2610	471	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2292 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6309	6900	No
v_3 or v_{av34}	1407 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, $v_{12A} = 2292$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	6309	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 33.1 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.681$	
Space mean speed in ramp influence area,	$S_R = 47.7$	mph
Space mean speed in outer lanes,	$S_0 = 56.7$	mph
Space mean speed for all vehicles,	$S = 49.5$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: I-385
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3706	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	2998	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	1331	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	1060	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3706	2998	1331	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1029	833	370	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	4488	3631	1612	pcph

Estimation of V12 Merge Areas

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

EQ

P = 0.619 Using Equation 1

FM

$v_{12} = v_F (P_{FM}) = 2780$ pc/h

12 F FM

Capacity Checks

		Actual	Maximum	LOS F?
v		8119	6900	Yes
FO				
v or v		1708 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	= 2780	(Equation 13-15, 13-16, 13-18, or 13-19)		
12A				

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v	8119	4600	Yes
R12			

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 44.4$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	M	= 2.529	
	S		
Space mean speed in ramp influence area,	S	= 14.5	mph
	R		
Space mean speed in outer lanes,	S	= 55.7	mph
	0		
Space mean speed for all vehicles,	S	= 17.1	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: Pelham Road
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5209	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1858	vph
Length of first accel/decel lane	625	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	751	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1325	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5209	1858	751	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1447	516	209	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	6309	2250	910	pcph

Estimation of V12 Diverge Areas

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

$$EQ$$

$$P = 0.499 \quad \text{Using Equation 5}$$

$$FD$$

$$v_{12R} = v_F + (v_F - v_R) P = 4275 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6309	6900	No
$v_{FO} = v_F - v_R$	4059	6900	No
v_R	2250	2000	Yes
v_3 or v_{av34}	2034 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, $v_{12A} = 4275$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4275	4400	No

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 35.4 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.631$	
Space mean speed in ramp influence area,	$S_R = 48.7$	mph
Space mean speed in outer lanes,	$S_0 = 61.8$	mph
Space mean speed for all vehicles,	$S = 52.2$	mph

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

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

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

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3351	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	751	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

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

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	539	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)	3351	751	539	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	931	209	150	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	4058	910	653	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 0.596 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2417 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4968	6900	No
v_3 or v_{av34}	1641 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, $v_{12A} = 2417$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4968	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 26.9 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.391$	
Space mean speed in ramp influence area,	$S_R = 53.0$	mph
Space mean speed in outer lanes,	$S_0 = 55.9$	mph
Space mean speed for all vehicles,	$S = 53.9$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3351	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	751	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1858	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1300	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3351	751	1858	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	931	209	516	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	4058	910	2250	pcph

Estimation of V12 Merge Areas

$$L = 518.35 \quad (\text{Equation 13-6 or 13-7})$$

$$EQ$$

$$P = 0.596 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2417 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4968	6900	No
v_3 or v_{av34}	1641 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, $v_{12A} = 2417$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4968	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 26.9 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.391$	
Space mean speed in ramp influence area,	$S_R = 53.0$	mph
Space mean speed in outer lanes,	$S_0 = 55.9$	mph
Space mean speed for all vehicles,	$S = 53.9$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 NB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4102	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	539	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	751	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2800	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4102	539	751	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1139	150	209	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	4968	653	910	pcph

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

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F(P) = 3078 \quad \text{pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	5621	6900	No
v ₃ or v _{av34}	1890 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} = 3078		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5621	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 24.9 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.349	
Space mean speed in ramp influence area,	S _R	= 53.7	mph
Space mean speed in outer lanes,	S ₀	= 55.0	mph
Space mean speed for all vehicles,	S	= 54.1	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: Pelham Road
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5871	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	1858	vph
Length of first accel/decel lane	1400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	335	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)	5871		1858		335	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1631		516		93	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	7110	2250	406	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.479 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 4577 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7110	6900	Yes
$v_{FO} = v_F - v_R$	4860	6900	No
v_R	2250	2100	Yes
v_3 or v_{av34}	2533 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, $v_{12A} = 4577$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4577	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 31.0$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

Speed Estimation

Intermediate speed variable,	$D = 0.501$	
Space mean speed in ramp influence area,	$S_R = 51.0$	mph
Space mean speed in outer lanes,	$S_0 = 59.8$	mph
Space mean speed for all vehicles,	$S = 53.8$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4013	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	335	vph
Length of first accel/decel lane	550	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1457	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2760	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4013	335	1457	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1115	93	405	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	4860	406	1765	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 0.593 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2881 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5266	6900	No
v_3 or v_{av34}	1979 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, $v_{12A} = 2881$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5266	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 27.5 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.392$	
Space mean speed in ramp influence area,	$S_R = 52.9$	mph
Space mean speed in outer lanes,	$S_0 = 54.7$	mph
Space mean speed for all vehicles,	$S = 53.6$	mph

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

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

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

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4013	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	335	vph
Length of first accel/decel lane	550	ft
Length of second accel/decel lane		ft

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

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1858	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2800	ft

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

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4013	335	1858	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1115	93	516	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	4860	406	2250	pcph

Estimation of V12 Merge Areas

$$L = 537.72 \text{ (Equation 13-6 or 13-7)}$$

EQ

$$P = 0.593 \text{ Using Equation 1}$$

FM

$$v_{12} = v_F(P) = 2881 \text{ pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v _{FO}	5266	6900	No
v ₃ or v _{av34}	1979 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} = 2881		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v _{R12}	5266	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 27.5 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable,	M	= 0.392	
Space mean speed in ramp influence area,	S _R	= 52.9	mph
Space mean speed in outer lanes,	S ₀	= 54.7	mph
Space mean speed for all vehicles,	S	= 53.6	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-85 SB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4348	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	1457	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	335	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2800	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4348	1457	335	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1208	405	93	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	5266	1765	406	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3262 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7031	6900	Yes
v_3 or v_{av34}	2004 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, $v_{12A} = 3262$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	7031	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 34.5 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.781$	
Space mean speed in ramp influence area,	$S_R = 45.9$	mph
Space mean speed in outer lanes,	$S_0 = 54.6$	mph
Space mean speed for all vehicles,	$S = 48.1$	mph

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Diverge Analysis

Analyst: JP
 Agency/Co.: Florence & Hutcheson
 Date performed: 4/5/2011
 Analysis time period: PM
 Freeway/Dir of Travel: I-85 NB
 Junction: Pelham Road
 Jurisdiction: Greenville, SC
 Analysis Year: 2015
 Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6704	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2060	vph
Length of first accel/decel lane	625	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	979	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1325	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	6704		2060		979	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1862		572		272	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	8119	2495	1186	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.442 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 4982 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	8119	6900	Yes
$v_{FO} = v_F - v_R$	5624	6900	No
v_R	2495	2000	Yes
v_3 or v_{av34}	3137 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or $v_{av34} > 2700$ pc/h?		Yes	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 5419$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12A}	5419	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 45.2$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

Speed Estimation

Intermediate speed variable,	$D = 0.653$	
Space mean speed in ramp influence area,	$S_R = 48.3$	mph
Space mean speed in outer lanes,	$S_0 = 59.2$	mph
Space mean speed for all vehicles,	$S = 51.4$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4644	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	979	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	786	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)	4644	979	786	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1290	272	218	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	5624	1186	952	pcph

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

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

$$EQ$$

$$P = 0.596 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F(P) = 3350 \quad \text{pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	6810	6900	No
v ₃ or v _{av34}	2274 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} = 3350		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	6810	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 36.2 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M _S = 0.646	
Space mean speed in ramp influence area,	S _R = 48.4	mph
Space mean speed in outer lanes,	S ₀ = 53.6	mph
Space mean speed for all vehicles,	S = 50.0	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4644	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	979	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	2060	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1300	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4644	979	2060	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1290	272	572	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	5624	1186	2495	pcph

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

$$L = 912.54 \quad (\text{Equation 13-6 or 13-7})$$

$$EQ$$

$$P = 0.596 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F(P) = 3350 \quad \text{pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	6810	6900	No
v ₃ or v _{av34}	2274 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} = 3350		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	6810	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 36.2 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.646	
	S		
Space mean speed in ramp influence area,	S _R	= 48.4	mph
	S		
Space mean speed in outer lanes,	S ₀	= 53.6	mph
	S		
Space mean speed for all vehicles,	S	= 50.0	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 NB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5623	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	786	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	979	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2800	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5623	786	979	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1562	218	272	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	6810	952	1186	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 4219 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7762	6900	Yes
v_3 or v_{av34}	2591 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, $v_{12A} = 4219$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	7762	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 36.0 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.873$	
Space mean speed in ramp influence area,	$S_R = 44.3$	mph
Space mean speed in outer lanes,	$S_0 = 51.7$	mph
Space mean speed for all vehicles,	$S = 46.5$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: Pelham Road
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5315	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	757	vph
Length of first accel/decel lane	1400	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	600	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)	5315		757		600	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1476		210		167	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	6437	917	727	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.557 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 3991 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6437	6900	No
$v_{FO} = v_F - v_R$	5520	6900	No
v_R	917	2100	No
$v_3 \text{ or } v_{av34}$	2446 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, $v_{12A} = 3991$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3991	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 26.0 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.381$	
Space mean speed in ramp influence area,	$S_R = 53.2$	mph
Space mean speed in outer lanes,	$S_0 = 60.2$	mph
Space mean speed for all vehicles,	$S = 55.6$	mph

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

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

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

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4558	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	600	vph
Length of first accel/decel lane	550	ft
Length of second accel/decel lane		ft

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

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1149	vph
Position of adjacent Ramp	Downstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2760	ft

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

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4558	600	1149	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1266	167	319	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	5520	727	1392	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 0.593 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3273 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6247	6900	No
v_3 or v_{av34}	2247 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, $v_{12A} = 3273$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	6247	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 32.9 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.501$	
Space mean speed in ramp influence area,	$S_R = 51.0$	mph
Space mean speed in outer lanes,	$S_0 = 53.7$	mph
Space mean speed for all vehicles,	$S = 51.9$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4558	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	600	vph
Length of first accel/decel lane	550	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	757	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2800	ft

_____Conversion to pc/h Under Base Conditions_____

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4558	600	757	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1266	167	210	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	5520	727	917	pcph

Estimation of V12 Merge Areas

$$L = 747.66 \quad (\text{Equation 13-6 or 13-7})$$

$$EQ$$

$$P = 0.593 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3273 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6247	6900	No
v_3 or v_{av34}	2247 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, $v_{12A} = 3273$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	6247	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 32.9 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.501$	
Space mean speed in ramp influence area,	$S_R = 51.0$	mph
Space mean speed in outer lanes,	$S_0 = 53.7$	mph
Space mean speed for all vehicles,	$S = 51.9$	mph

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

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-85 SB
Junction: Pelham Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

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

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5158	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	1149	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	600	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	On	
Distance to adjacent Ramp	2800	ft

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

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5158	1149	600	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1433	319	167	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	6247	1392	727	pcph

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

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3870 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		7639	6900	Yes
v ₃ or v _{av34}		2377 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} = 3870			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	7639	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 36.5 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.938	
Space mean speed in ramp influence area,	S _R	= 43.1	mph
Space mean speed in outer lanes,	S ₀	= 53.0	mph
Space mean speed for all vehicles,	S	= 45.8	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 4/20/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Butler Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3839	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	322	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	925	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)	3839	322	925	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1066	89	257	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	4649	390	1120	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.626 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3055 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4649	6900	No
$v_{FO} = v_F - v_R$	4259	6900	No
v_R	390	2100	No
v_3 or v_{av34}	1594 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, $v_{12A} = 3055$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3055	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 17.0$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence B			

Speed Estimation

Intermediate speed variable,	$D_S = 0.333$	
Space mean speed in ramp influence area,	$S_R = 54.0$	mph
Space mean speed in outer lanes,	$S_0 = 63.5$	mph
Space mean speed for all vehicles,	$S = 56.9$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 4/20/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Butler Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3517	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	925	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	332	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)	3517	925	332	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	977	257	92	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	4259	1120	402	pcph

Estimation of V12 Merge Areas

$$L = 1590.91 \text{ (Equation 13-6 or 13-7)}$$

EQ

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

FM

$$v_{12} = v_F (P_{FM}) = 2591 \text{ pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v _{FO}	5379	6900	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		No	
If yes, v _{12A} = 2591		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v _{R12}	5379	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 27.0 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	M = 0.381	
Space mean speed in ramp influence area,	S _R = 53.1	mph
Space mean speed in outer lanes,	S ₀ = 55.8	mph
Space mean speed for all vehicles,	S = 53.9	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 4/20/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Butler Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2615	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	802	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	244	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)	2615		802		244	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	726		223		68	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	3167	971	296	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.636 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 2368 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_F = v_{Fi}$	3167	6900	No
$v_F = v_F - v_R$	2196	6900	No
v_R	971	2100	No
v_3 or v_{av34}	799 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, $v_{12A} = 2368$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2368	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 15.6 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.385$	
Space mean speed in ramp influence area,	$S_R = 53.1$	mph
Space mean speed in outer lanes,	$S_0 = 65.8$	mph
Space mean speed for all vehicles,	$S = 55.8$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 4/20/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Butler Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1813	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	244	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	802	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)	1813	244	802	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	504	68	223	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	2196	296	971	pcph

Estimation of V12 Merge Areas

$$L = 1150.69 \text{ (Equation 13-6 or 13-7)}$$

EQ

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

FM

$$v_{12} = v_F (P_{FM}) = 1360 \text{ pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v _{FO}	2492	6900	No
v ₃ or v _{av34}	836 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} = 1360		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v _{R12}	2492	4600	No

Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v _R + 0.0078 v ₁₂ - 0.00627 L _A	= 8.9	pc/mi/ln
Level of service for ramp-freeway junction areas of influence	A	

Speed Estimation

Intermediate speed variable,	M _S = 0.206	
Space mean speed in ramp influence area,	S _R = 56.3	mph
Space mean speed in outer lanes,	S ₀ = 58.8	mph
Space mean speed for all vehicles,	S = 57.1	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 4/20/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Butler Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4295	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	262	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	1024	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)	4295		262		1024	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1193		73		284	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	5202	317	1240	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.615 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3323 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5202	6900	No
$v_{FO} = v_F - v_R$	4885	6900	No
v_R	317	2100	No
v_3 or v_{av34}	1879 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, $v_{12A} = 3323$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3323	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 19.3$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence B			

Speed Estimation

Intermediate speed variable,	$D_S = 0.327$	
Space mean speed in ramp influence area,	$S_R = 54.1$	mph
Space mean speed in outer lanes,	$S_0 = 62.4$	mph
Space mean speed for all vehicles,	$S = 56.8$	mph

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

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 4/20/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Butler Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

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

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4033	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	1024	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	262	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)	4033	1024	262	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1120	284	73	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	4884	1240	317	pcph

Estimation of V12 Merge Areas

$$L = 1750.34 \text{ (Equation 13-6 or 13-7)}$$

EQ

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

FM

$$v_{12} = v_F (P_{FM}) = 2971 \text{ pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v _{FO}	6124	6900	No
v ₃ or v _{av34}	1913 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} = 2971		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v _{R12}	6124	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 30.9 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	M _S = 0.485	
Space mean speed in ramp influence area,	S _R = 51.3	mph
Space mean speed in outer lanes,	S ₀ = 54.9	mph
Space mean speed for all vehicles,	S = 52.4	mph

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Diverge Analysis

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 4/20/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Butler Rd off-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5134	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	831	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	463	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)	5134	831	463	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1426	231	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	6218	1006	561	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.558 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 3916 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6218	6900	No
$v_{FO} = v_F - v_R$	5212	6900	No
v_R	1006	2100	No
v_3 or v_{av34}	2302 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, $v_{12A} = 3916$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3916	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 28.9$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence D			

Speed Estimation

Intermediate speed variable,	$D_S = 0.389$	
Space mean speed in ramp influence area,	$S_R = 53.0$	mph
Space mean speed in outer lanes,	$S_0 = 60.7$	mph
Space mean speed for all vehicles,	$S = 55.6$	mph

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_____Merge Analysis_____

Analyst: NJ
Agency/Co.: Florence & Hutcheson
Date performed: 4/20/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Butler Rd on-ramp
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4303	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	463	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	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)	4303	463	831	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1195	129	231	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	5211	561	1006	pcph

Estimation of V12 Merge Areas

$$L = 1852.61 \text{ (Equation 13-6 or 13-7)}$$

EQ

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

FM

$$v_{12} = v_F (P_{FM}) = 3228 \text{ pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v _{FO}	5772	6900	No
v ₃ or v _{av34}	1983 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} = 3228		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v _{R12}	5772	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 25.4 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	M _S = 0.358	
Space mean speed in ramp influence area,	S _R = 53.5	mph
Space mean speed in outer lanes,	S ₀ = 54.7	mph
Space mean speed for all vehicles,	S = 53.9	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4442	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	777	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	1219	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)	4442		777		1219	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1234		216		339	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	5380	941	1476	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.582 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3525$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5380	6750	No
$v_{FO} = v_F - v_R$	4439	6750	No
v_R	941	2100	No
v_3 or v_{av34}	1855 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, $v_{12A} = 3525$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3525	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	= 21.1	pc/mi/ln
Level of service for ramp-freeway junction areas of influence C			

Speed Estimation

Intermediate speed variable,	$D_S = 0.383$	
Space mean speed in ramp influence area,	$S_R = 50.0$	mph
Space mean speed in outer lanes,	$S_0 = 57.0$	mph
Space mean speed for all vehicles,	$S = 52.2$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3665	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	1219	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	1139	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)	3665	1219	1139	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1018	339	316	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	4439	1476	1379	pcph

Estimation of V12 Merge Areas

$$L = 6066.87 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.841 \text{ Using Equation 3}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3733 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5915	6750	No
v_3 or v_{av34}	706 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, $v_{12A} = 3733$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5915	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 38.5 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.935$	
Space mean speed in ramp influence area,	$S_R = 42.8$	mph
Space mean speed in outer lanes,	$S_0 = 54.3$	mph
Space mean speed for all vehicles,	$S = 43.9$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3665	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	1219	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	777	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)	3665	1219	777	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1018	339	216	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	4439	1476	941	pcph

Estimation of V12 Merge Areas

$$L = 1705.61 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2700 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5915	6750	No
v_3 or v_{av34}	1739 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, $v_{12A} = 2700$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5915	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 30.5 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.476$	
Space mean speed in ramp influence area,	$S_R = 48.8$	mph
Space mean speed in outer lanes,	$S_0 = 50.5$	mph
Space mean speed for all vehicles,	$S = 49.3$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3729	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	1327	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	213	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)	3729		1327		213	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1036		369		59	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	4516	1607	258	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.573 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 3274 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4516	6750	No
$v_{FO} = v_F - v_R$	2909	6750	No
v_R	1607	2100	No
v_3 or v_{av34}	1242 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, $v_{12A} = 3274$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3274	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 23.4 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.443$	
Space mean speed in ramp influence area,	$S_R = 49.2$	mph
Space mean speed in outer lanes,	$S_0 = 59.4$	mph
Space mean speed for all vehicles,	$S = 51.7$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3729	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	1327	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	535	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)	3729	1327	535	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1036	369	149	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	4516	1607	648	pcph

Estimation of V12 Diverge Areas

$$L = 12287.62 \text{ Equation 13-12 or 13-13}$$

EQ

$$P = 0.971 \text{ Using Equation 6}$$

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 4432 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4516	6750	No
$v_{FO} = v_F - v_R$	2909	6750	No
v_R	1607	2100	No
v_3 or v_{av34}	84 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, $v_{12A} = 4432$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4432	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 33.4 \text{ pc/mi/ln}$
Level of service for ramp-freeway junction areas of influence D		

Speed Estimation

Intermediate speed variable,	$D_S = 0.443$	
Space mean speed in ramp influence area,	$S_R = 49.2$	mph
Space mean speed in outer lanes,	$S_0 = 60.3$	mph
Space mean speed for all vehicles,	$S = 49.4$	mph

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

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

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

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2402	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	213	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	1327	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)	2402	213	1327	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	667	59	369	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	2909	258	1607	pcph

Estimation of V12 Merge Areas

$$L = 1295.14 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 1802 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3167	6750	No
v_3 or v_{av34}	1107 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, $v_{12A} = 1802$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3167	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 12.0 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.217$	
Space mean speed in ramp influence area,	$S_R = 52.2$	mph
Space mean speed in outer lanes,	$S_0 = 52.8$	mph
Space mean speed for all vehicles,	$S = 52.4$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5057	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	789	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	1131	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)	5057	789	1131	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1405	219	314	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	6125	956	1370	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.563 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3866 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6125	6750	No
$v_{FO} = v_F - v_R$	5169	6750	No
v_R	956	2100	No
v_3 or v_{av34}	2259 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, $v_{12A} = 3866$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3866	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 24.0$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence C			

Speed Estimation

Intermediate speed variable,	$D_S = 0.384$	
Space mean speed in ramp influence area,	$S_R = 50.0$	mph
Space mean speed in outer lanes,	$S_0 = 55.4$	mph
Space mean speed for all vehicles,	$S = 51.9$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4268	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	1131	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	1214	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)	4268	1131	1214	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1186	314	337	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	5169	1370	1470	pcph

Estimation of V12 Merge Areas

$$L = 6467.22 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.860 \text{ Using Equation 3}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 4447 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6539	6750	No
v_3 or v_{av34}	722 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, $v_{12A} = 4447$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	6539	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 43.3 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 1.532$	
Space mean speed in ramp influence area,	$S_R = 35.1$	mph
Space mean speed in outer lanes,	$S_0 = 54.2$	mph
Space mean speed for all vehicles,	$S = 36.5$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4268	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	1131	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	789	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)	4268	1131	789	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1186	314	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	5169	1370	956	pcph

Estimation of V12 Merge Areas

$$L = 1839.15 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3144 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6539	6750	No
v_3 or v_{av34}	2025 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, $v_{12A} = 3144$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	6539	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 33.2 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.578$	
Space mean speed in ramp influence area,	$S_R = 47.5$	mph
Space mean speed in outer lanes,	$S_0 = 49.5$	mph
Space mean speed for all vehicles,	$S = 48.1$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5632	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	1119	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	621	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)	5632	1119	621	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1564	311	173	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	6821	1355	752	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.527 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 4236 \quad \text{pc/h}$$

Capacity Checks

		Actual	Maximum	LOS F?
$v_{Fi} = v_F$		6821	6750	Yes
$v_{FO} = v_F - v_R$		5466	6750	No
v_R		1355	2100	No
v_3 or v_{av34}		2585 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, $v_{12A} = 4236$			(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4236	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 31.7$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

Speed Estimation

Intermediate speed variable,	$D = 0.420$	
Space mean speed in ramp influence area,	$S_R = 49.5$	mph
Space mean speed in outer lanes,	$S_0 = 54.2$	mph
Space mean speed for all vehicles,	$S = 51.2$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5632	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	1119	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	1018	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)	5632		1119		1018	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1564		311		283	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	6821	1355	1233	pcph

Estimation of V12 Diverge Areas

$$L = 9871.66 \text{ (Equation 13-12 or 13-13)}$$

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P = 6821 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6821	6750	Yes
$v_{FO} = v_F - v_R$	5466	6750	No
v_R	1355	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, $v_{12A} = 6821$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	6821	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 53.9$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence F			

Speed Estimation

Intermediate speed variable,	$D = 0.420$	
Space mean speed in ramp influence area,	$S_R = 49.5$	mph
Space mean speed in outer lanes,	$S_0 = 60.3$	mph
Space mean speed for all vehicles,	$S = 49.5$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Woodruff
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4513	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	621	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	1119	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)	4513	621	1119	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1254	173	311	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	5466	752	1355	pcph

Estimation of V12 Merge Areas

$$L = 1948.05 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3386 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6218	6750	No
v_3 or v_{av34}	2080 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, $v_{12A} = 3386$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	6218	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 28.0+ \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.430$	
Space mean speed in ramp influence area,	$S_R = 49.4$	mph
Space mean speed in outer lanes,	$S_0 = 49.3$	mph
Space mean speed for all vehicles,	$S = 49.4$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4884	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	1139	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	919	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)	4884	1139	919	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1357	316	255	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	5915	1379	1113	pcph

Estimation of V12 Diverge Areas

$$L = 2466.66 \text{ (Equation 13-12 or 13-13)}$$

EQ

$$P = 0.568 \text{ Using Equation 7}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3958 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5915	6750	No
$v_{FO} = v_F - v_R$	4536	6750	No
v_R	1379	2100	No
v_3 or v_{av34}	1957 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, $v_{12A} = 3958$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3958	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 29.3$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence D			

Speed Estimation

Intermediate speed variable,	$D = 0.422$	
Space mean speed in ramp influence area,	$S_R = 49.5$	mph
Space mean speed in outer lanes,	$S_0 = 56.6$	mph
Space mean speed for all vehicles,	$S = 51.7$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4884	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	1139	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	1219	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)	4884	1139	1219	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1357	316	339	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	5915	1379	1476	pcph

Estimation of V12 Diverge Areas

$$L = 14436.48 \text{ Equation 13-12 or 13-13}$$

$$EQ$$

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

$$FD$$

$$v_{12R} = v_F + (v_R - v_F) P = 5915 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5915	6750	No
$v_{FO} = v_F - v_R$	4536	6750	No
v_R	1379	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, $v_{12A} = 5915$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	5915	4400	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 46.1 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.422$	
Space mean speed in ramp influence area,	$S_R = 49.5$	mph
Space mean speed in outer lanes,	$S_0 = 60.3$	mph
Space mean speed for all vehicles,	$S = 49.5$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3745	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	919	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	1938	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)	3745		919		1938	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1040		255		538	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	4536	1113	2347	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.595 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3151 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4536	6750	No
$v_{FO} = v_F - v_R$	3423	6750	No
v_R	1113	1900	No
v_3 or v_{av34}	1385 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, $v_{12A} = 3151$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3151	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 22.9$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence C			

Speed Estimation

Intermediate speed variable,	$D = 0.658$	
Space mean speed in ramp influence area,	$S_R = 46.4$	mph
Space mean speed in outer lanes,	$S_0 = 58.8$	mph
Space mean speed for all vehicles,	$S = 49.6$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3745	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	919	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	1139	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)	3745	919	1139	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1040	255	316	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	4536	1113	1379	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.595 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3151 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4536	6750	No
$v_{FO} = v_F - v_R$	3423	6750	No
v_R	1113	1900	No
v_3 or v_{av34}	1385 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, $v_{12A} = 3151$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3151	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 22.9$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence C			

Speed Estimation

Intermediate speed variable,	$D_S = 0.658$	
Space mean speed in ramp influence area,	$S_R = 46.4$	mph
Space mean speed in outer lanes,	$S_0 = 58.8$	mph
Space mean speed for all vehicles,	$S = 49.6$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2826	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1938	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	1593	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)	2826	1938	1593	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	785	538	443	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	3423	2347	1929	pcph

Estimation of V12 Merge Areas

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

EQ

P = 0.555 Using Equation 0

FM

v = v (P) = 1900 pc/h

12 F FM

Capacity Checks

		Actual	Maximum	LOS F?
v		5770	6750	No
FO				
v or v		1523 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	Yes		
3 av34	12			
If yes, v	= 1956	(Equation 13-15, 13-16, 13-18, or 13-19)		
12A				

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v	5770	4600	No
12A			

Level of Service Determination (if not F)

Density, D = $5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 9.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	M	= 0.204	
	S		
Space mean speed in ramp influence area,	S	= 52.3	mph
	R		
Space mean speed in outer lanes,	S	= 51.5	mph
	0		
Space mean speed for all vehicles,	S	= 52.1	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2826	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1938	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	919	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)	2826	1938	919	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	785	538	255	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	3423	2347	1113	pcph

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

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 1900 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		5770	6750	No
v ₃ or v _{av34}		1523 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} = 1956			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{12A}	5770	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 9.7 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M _S = 0.204	
Space mean speed in ramp influence area,	S _R = 52.3	mph
Space mean speed in outer lanes,	S ₀ = 51.5	mph
Space mean speed for all vehicles,	S = 52.1	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3548	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1652	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	1299	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)	3548		1652		1299	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	986		459		361	v
Trucks and buses	18		18		18	%
Recreational vehicles	0		0		0	%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5		1.5		1.5	
Recreational vehicle PCE, ER	1.2		1.2		1.2	

Heavy vehicle adjustment, fHV	0.917	0.917	0.917	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4297	2001	1573	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.260 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 2598 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4297	9000	No
$v_{FO} = v_F - v_R$	2296	9000	No
v_R	2001	4200	No
$v_3 \text{ or } v_{av34}$	849 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, $v_{12A} = 2598$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2598	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = -13.9 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.478$	
Space mean speed in ramp influence area,	$S_R = 48.8$	mph
Space mean speed in outer lanes,	$S_0 = 60.3$	mph
Space mean speed for all vehicles,	$S = 52.8$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3548	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1652	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	844	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)	3548		1652		844	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	986		459		234	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	4297	2001	1022	pcph

Estimation of V12 Diverge Areas

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

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2598 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4297	9000	No
$v_{FO} = v_F - v_R$	2296	9000	No
v_R	2001	4200	No
v_3 or v_{av34}	849 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, $v_{12A} = 2598$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2598	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -13.9$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.478$	
Space mean speed in ramp influence area,	$S_R = 48.8$	mph
Space mean speed in outer lanes,	$S_0 = 60.3$	mph
Space mean speed for all vehicles,	$S = 52.8$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1896	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	1299	vph
Length of first accel/decel lane	1100	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	535	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)	1896	1299	535	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	527	361	149	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	2296	1573	648	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 1397 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3869	6750	No
v_3 or v_{av34}	899 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, $v_{12A} = 1397$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3869	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 21.0 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.331$	
Space mean speed in ramp influence area,	$S_R = 50.7$	mph
Space mean speed in outer lanes,	$S_0 = 53.6$	mph
Space mean speed for all vehicles,	$S = 51.3$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1896	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	1299	vph
Length of first accel/decel lane	1100	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1652	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)	1896	1299	1652	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	527	361	459	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	2296	1573	2001	pcph

Estimation of V12 Merge Areas

$$L = 482.97 \text{ (Equation 13-6 or 13-7)}$$

EQ

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

FM

$$v_{12} = v_F(P) = 1397 \text{ pc/h}$$

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v _{FO}	3869	6750	No
v ₃ or v _{av34}	899 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} = 1397		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v _{R12}	3869	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 21.0$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	M	= 0.331	
Space mean speed in ramp influence area,	S _R	= 50.7	mph
Space mean speed in outer lanes,	S ₀	= 53.6	mph
Space mean speed for all vehicles,	S	= 51.3	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3194	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	535	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	1327	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)	3194	535	1327	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	887	149	369	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	3868	648	1607	pcph

Estimation of V12 Merge Areas

$$L = 7724.48 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 1.000 \text{ Using Equation 3}$$

$$FM$$

$$v_{12} = v_F(P) = 3868 \text{ pc/h}$$

Capacity Checks

		Actual	Maximum	LOS F?
v _{FO}		4516	6750	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} = 3868			(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v _{R12}	4516	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 34.6 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	M	= 0.623	
Space mean speed in ramp influence area,	S _R	= 46.9	mph
Space mean speed in outer lanes,	S ₀	= 55.0	mph
Space mean speed for all vehicles,	S	= 46.9	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3194	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	535	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	1299	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)	3194	535	1299	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	887	149	361	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	3868	648	1573	pcph

Estimation of V12 Merge Areas

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

$$EQ$$

$$P = 0.603 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2333 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4516	6750	No
v_3 or v_{av34}	1535 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, $v_{12A} = 2333$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4516	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 22.7 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.343$	
Space mean speed in ramp influence area,	$S_R = 50.5$	mph
Space mean speed in outer lanes,	$S_0 = 51.3$	mph
Space mean speed for all vehicles,	$S = 50.8$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5399	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	1214	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	830	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)	5399		1214		830	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1500		337		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	6539	1470	1005	pcph

Estimation of V12 Diverge Areas

$$L = 2527.65 \text{ (Equation 13-12 or 13-13)}$$

EQ

$$P = 0.548 \text{ Using Equation 7}$$

FD

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

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6539	6750	No
$v_{FO} = v_F - v_R$	5069	6750	No
v_R	1470	2100	No
v_3 or v_{av34}	2292 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, $v_{12A} = 4247$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

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

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 31.8$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence D			

Speed Estimation

Intermediate speed variable,	$D = 0.430$	
Space mean speed in ramp influence area,	$S_R = 49.4$	mph
Space mean speed in outer lanes,	$S_0 = 55.3$	mph
Space mean speed for all vehicles,	$S = 51.3$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5399	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	1214	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	1131	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)	5399	1214	1131	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1500	337	314	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	6539	1470	1370	pcph

Estimation of V12 Diverge Areas

$$L = 12491.22 \text{ Equation 13-12 or 13-13}$$

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 6539 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6539	6750	No
$v_{FO} = v_F - v_R$	5069	6750	No
v_R	1470	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, $v_{12A} = 6539$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	6539	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 51.5$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence E			

Speed Estimation

Intermediate speed variable,	$D_S = 0.430$	
Space mean speed in ramp influence area,	$S_R = 49.4$	mph
Space mean speed in outer lanes,	$S_0 = 60.3$	mph
Space mean speed for all vehicles,	$S = 49.4$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4185	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	830	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	1895	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)	4185	830	1895	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1163	231	526	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	5069	1005	2295	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.587 Using Equation 5

FD

$v_{12} = v_R + (v_F - v_R) P = 3391$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5069	6750	No
$v_{FO} = v_F - v_R$	4064	6750	No
v_R	1005	1900	No
v_3 or v_{av34}	1678 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, $v_{12A} = 3391$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3391	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 25.0$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.648$	
Space mean speed in ramp influence area,	$S_R = 46.6$	mph
Space mean speed in outer lanes,	$S_0 = 57.7$	mph
Space mean speed for all vehicles,	$S = 49.7$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4185	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	830	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	1214	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)	4185	830	1214	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1163	231	337	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	5069	1005	1470	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.587 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 3391 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5069	6750	No
$v_{FO} = v_F - v_R$	4064	6750	No
v_R	1005	1900	No
v_3 or v_{av34}	1678 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, $v_{12A} = 3391$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3391	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,	$D = 0.648$	
Space mean speed in ramp influence area,	$S_R = 46.6$	mph
Space mean speed in outer lanes,	$S_0 = 57.7$	mph
Space mean speed for all vehicles,	$S = 49.7$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3355	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1895	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	896	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)	3355	1895	896	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	932	526	249	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	4063	2295	1085	pcph

Estimation of V12 Merge Areas

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

EQ

P = 0.555 Using Equation 0

FM

v = v (P) = 2255 pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	6358	6750	No
FO			
v or v	1808 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	Yes	
3 av34	12		
If yes, v	= 2321	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v	6358	4600	Yes
12A			

Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 12.2 pc/mi/ln

R R 12 A

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

Speed Estimation

Intermediate speed variable,	M = 0.310	
	S	
Space mean speed in ramp influence area,	S = 51.0	mph
	R	
Space mean speed in outer lanes,	S = 50.5	mph
	0	
Space mean speed for all vehicles,	S = 50.8	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3355	vph

_____On Ramp Data_____

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1895	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	830	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)	3355	1895	830	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	932	526	231	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	4063	2295	1005	pcph

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

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2255 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		6358	6750	No
v ₃ or v _{av34}		1808 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} = 2321			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{12A}	6358	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 12.2 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.310	
Space mean speed in ramp influence area,	S _R	= 51.0	mph
Space mean speed in outer lanes,	S ₀	= 50.5	mph
Space mean speed for all vehicles,	S	= 50.8	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	6594	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	2730	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	750	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)	6594	2730	750	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1832	758	208	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	7986	3306	908	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.260 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P = 4523$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7986	9000	No
$v_{FO} = v_F - v_R$	4680	9000	No
v_R	3306	4200	No
v_3 or v_{av34}	1731 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, $v_{12A} = 4523$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4523	4400	Yes

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 2.6$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.596$	
Space mean speed in ramp influence area,	$S_R = 47.3$	mph
Space mean speed in outer lanes,	$S_0 = 57.5$	mph
Space mean speed for all vehicles,	$S = 51.2$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	6594	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	2730	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	1796	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)	6594		2730		1796	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1832		758		499	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	7986	3306	2175	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.260 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P = 4523 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7986	9000	No
$v_{FO} = v_F - v_R$	4680	9000	No
v_R	3306	4200	No
v_3 or v_{av34}	1731 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, $v_{12A} = 4523$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4523	4400	Yes

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 2.6$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.596$	
Space mean speed in ramp influence area,	$S_R = 47.3$	mph
Space mean speed in outer lanes,	$S_0 = 57.5$	mph
Space mean speed for all vehicles,	$S = 51.2$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3864	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	750	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	1018	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)	3864	750	1018	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1073	208	283	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	4680	908	1233	pcph

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

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

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2847 \quad \text{pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	5588	6750	No
v ₃ or v _{av34}	1833 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} = 2847		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	5588	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 27.4 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M _S = 0.422	
Space mean speed in ramp influence area,	S _R = 49.5	mph
Space mean speed in outer lanes,	S ₀ = 50.2	mph
Space mean speed for all vehicles,	S = 49.7	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3864	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	750	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	2730	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)	3864	750	2730	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1073	208	758	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	4680	908	3306	pcph

Estimation of V12 Merge Areas

$$L = 850.83 \quad (\text{Equation 13-6 or 13-7})$$

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2847 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5588	6750	No
v_3 or v_{av34}	1833 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, $v_{12A} = 2847$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5588	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 27.4 \quad \text{pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.422$	
Space mean speed in ramp influence area,	$S_R = 49.5$	mph
Space mean speed in outer lanes,	$S_0 = 50.2$	mph
Space mean speed for all vehicles,	$S = 49.7$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4614	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	1018	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	1119	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)	4614	1018	1119	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1282	283	311	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	5588	1233	1355	pcph

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

$$L = 6513.17 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.936 \text{ Using Equation 3}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 5229 \text{ pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	6821	6750	Yes
v ₃ or v _{av34}	359 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} = 5229		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	6821	4600	Yes

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

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

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

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

Intermediate speed variable,	M _S = 2.763	
Space mean speed in ramp influence area,	S _R = 19.1	mph
Space mean speed in outer lanes,	S ₀ = 55.0	mph
Space mean speed for all vehicles,	S = 19.8	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: I-85
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4614	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	1018	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	750	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)	4614	1018	750	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1282	283	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	5588	1233	908	pcph

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

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

$$EQ$$

$$P = 0.603 \quad \text{Using Equation 1}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3371 \quad \text{pc/h}$$

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

		Actual	Maximum	LOS F?
v _{FO}		6821	6750	Yes
v ₃ or v _{av34}		2217 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} = 3371			(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	6821	4600	Yes

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 35.1 \quad \text{pc/mi/ln}$$

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

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

Intermediate speed variable,	M	= 0.655	
Space mean speed in ramp influence area,	S _R	= 46.5	mph
Space mean speed in outer lanes,	S ₀	= 48.8	mph
Space mean speed for all vehicles,	S	= 47.2	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4764	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1593	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	451	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)	4764		1593		451	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1323		443		125	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	5770	1929	546	pcph

Estimation of V12 Diverge Areas

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

EQ

P = 0.260 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 2928 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5770	9000	No
$v_{FO} = v_F - v_R$	3841	9000	No
v_R	1929	4200	No
$v_3 \text{ or } v_{av34}$	1421 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, $v_{12A} = 2928$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2928	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = -11.1 \text{ pc/mi/ln}$

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.472$	
Space mean speed in ramp influence area,	$S_R = 48.9$	mph
Space mean speed in outer lanes,	$S_0 = 58.7$	mph
Space mean speed for all vehicles,	$S = 53.3$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4764	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1593	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	1938	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)	4764	1593	1938	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1323	443	538	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	5770	1929	2347	pcph

Estimation of V12 Diverge Areas

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

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2928 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5770	9000	No
$v_{FO} = v_F - v_R$	3841	9000	No
v_R	1929	4200	No
v_3 or v_{av34}	1421 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, $v_{12A} = 2928$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2928	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -11.1$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.472$	
Space mean speed in ramp influence area,	$S_R = 48.9$	mph
Space mean speed in outer lanes,	$S_0 = 58.7$	mph
Space mean speed for all vehicles,	$S = 53.3$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3171	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	451	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

_____Adjacent Ramp Data (if one exists)_____

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1593	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)	3171	451	1593	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	881	125	443	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	3840	546	1929	pcph

Estimation of V12 Merge Areas

$$L = 1556.00 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

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

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2379 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4386	6750	No
v_3 or v_{av34}	1461 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, $v_{12A} = 2379$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4386	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 18.6 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.259$	
Space mean speed in ramp influence area,	$S_R = 51.6$	mph
Space mean speed in outer lanes,	$S_0 = 51.5$	mph
Space mean speed for all vehicles,	$S = 51.6$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3496	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	792	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	844	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)	3496		792		844	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	971		220		234	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	4234	959	1022	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.610 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 2957 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4234	6750	No
$v_{FO} = v_F - v_R$	3275	6750	No
v_R	959	2100	No
v_3 or v_{av34}	1277 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, $v_{12A} = 2957$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2957	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= 19.8$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence B			

Speed Estimation

Intermediate speed variable,	$D = 0.384$	
Space mean speed in ramp influence area,	$S_R = 50.0$	mph
Space mean speed in outer lanes,	$S_0 = 59.3$	mph
Space mean speed for all vehicles,	$S = 52.5$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2704	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	844	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	1652	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)	2704	844	1652	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	751	234	459	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	3275	1022	2001	pcph

Estimation of V12 Merge Areas

$$L = 7408.37 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.844 \text{ Using Equation 3}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 2765 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4297	6750	No
v_3 or v_{av34}	510 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, $v_{12A} = 2765$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	4297	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 25.1 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 0.358$	
Space mean speed in ramp influence area,	$S_R = 50.3$	mph
Space mean speed in outer lanes,	$S_0 = 55.0$	mph
Space mean speed for all vehicles,	$S = 50.9$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2704	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	844	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	792	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)	2704	844	792	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	751	234	220	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	3275	1022	959	pcph

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

$$L = 1536.96 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

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

$$FM$$

$$v_{12} = v_F(P) = 2029 \text{ pc/h}$$

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

	Actual	Maximum	LOS F?
v _{FO}	4297	6750	No
v ₃ or v _{av34}	1246 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} = 2029		(Equation 13-15, 13-16, 13-18, or 13-19)	

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

	Actual	Max Desirable	Violation?
v _{R12}	4297	4600	No

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

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 19.4 \text{ pc/mi/ln}$$

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

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

Intermediate speed variable,	M _S = 0.268	
Space mean speed in ramp influence area,	S _R = 51.5	mph
Space mean speed in outer lanes,	S ₀ = 52.3	mph
Space mean speed for all vehicles,	S = 51.7	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5250	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	896	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	825	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)	5250	896	825	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1458	249	229	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	6358	1085	999	pcph

Estimation of V12 Diverge Areas

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

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P = 2456 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6358	9000	No
$v_{FO} = v_F - v_R$	5273	9000	No
v_R	1085	4200	No
v_3 or v_{av34}	1951 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, $v_{12A} = 2543$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12A}	2543	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -14.4$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.396$	
Space mean speed in ramp influence area,	$S_R = 49.9$	mph
Space mean speed in outer lanes,	$S_0 = 56.8$	mph
Space mean speed for all vehicles,	$S = 53.8$	mph

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Diverge Analysis

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5250	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	896	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	1895	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)	5250		896		1895	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1458		249		526	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	6358	1085	2295	pcph

Estimation of V12 Diverge Areas

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

EQ

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

FD

$$v_{12} = v_R + (v_F - v_R) P_{FD} = 2456 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6358	9000	No
$v_{FO} = v_F - v_R$	5273	9000	No
v_R	1085	4200	No
v_3 or v_{av34}	1951 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, $v_{12A} = 2543$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12A}	2543	4400	No

Level of Service Determination (if not F)

Density,	$D = 4.252 + 0.0086 v_R - 0.009 L_D$	$= -14.4$	pc/mi/ln
Level of service for ramp-freeway junction areas of influence A			

Speed Estimation

Intermediate speed variable,	$D_S = 0.396$	
Space mean speed in ramp influence area,	$S_R = 49.9$	mph
Space mean speed in outer lanes,	$S_0 = 56.8$	mph
Space mean speed for all vehicles,	$S = 53.8$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 NB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4354	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	825	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	896	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)	4354	825	896	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1209	229	249	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	5273	999	1085	pcph

Estimation of V12 Merge Areas

L = 1959.61 (Equation 13-6 or 13-7)

EQ

P = 0.619 Using Equation 2

FM

v = v (P) = 3263 pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v	6272	6750	No
FO			
v or v	2010 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	= 3263	(Equation 13-15, 13-16, 13-18, or 13-19)	
12A			

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v	6272	4600	No
R12			

Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 28.9 pc/mi/ln

R R 12 A

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

Speed Estimation

Intermediate speed variable,	M = 0.463	
	S	
Space mean speed in ramp influence area,	S = 49.0	mph
	R	
Space mean speed in outer lanes,	S = 49.6	mph
	0	
Space mean speed for all vehicles,	S = 49.2	mph

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

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

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

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	5569	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	771	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	1796	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)	5569		771		1796	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	1547		214		499	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	6745	934	2175	pcph

Estimation of V12 Diverge Areas

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

EQ

$$P = 0.548 \quad \text{Using Equation 5}$$

FD

$$v_{12} = v_R + (v_F - v_R) P = 4121 \quad \text{pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6745	6750	No
$v_{FO} = v_F - v_R$	5811	6750	No
v_R	934	2100	No
v_3 or v_{av34}	2624 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, $v_{12A} = 4121$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4121	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,	$D_S = 0.382$	
Space mean speed in ramp influence area,	$S_R = 50.0$	mph
Space mean speed in outer lanes,	$S_0 = 54.0$	mph
Space mean speed for all vehicles,	$S = 51.5$	mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: AM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4798	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	1796	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	2730	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)	4798	1796	2730	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1333	499	758	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	5811	2175	3306	pcph

Estimation of V12 Merge Areas

$L = 12239.91$ Equation 13-6 or 13-7)
 EQ
 $P = 1.000$ Using Equation 3
 FM
 $v_{12} = v_F (P_{FM}) = 5811$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7986	6750	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, $v_{12A} = 5811$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	7986	4600	Yes

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 57.4$ pc/mi/ln
 Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$M_S = 11.650$
Space mean speed in ramp influence area,	$S_R = -96.5$ mph
Space mean speed in outer lanes,	$S_0 = 55.0$ mph
Space mean speed for all vehicles,	$S =$ mph

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_____Merge Analysis_____

Analyst: JP
Agency/Co.: Florence & Hutcheson
Date performed: 4/5/2011
Analysis time period: PM
Freeway/Dir of Travel: I-385 SB
Junction: Roper Mtn Rd
Jurisdiction: Greenville, SC
Analysis Year: 2015
Description: I-85/I-385 No-Build

_____Freeway Data_____

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	4798	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	1796	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	771	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)	4798	1796	771	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1333	499	214	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	5811	2175	934	pcph

Estimation of V12 Merge Areas

$$L = 2326.40 \text{ (Equation 13-6 or 13-7)}$$

$$EQ$$

$$P = 0.613 \text{ Using Equation 2}$$

$$FM$$

$$v_{12} = v_F (P_{FM}) = 3560 \text{ pc/h}$$

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7986	6750	Yes
v_3 or v_{av34}	2251 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, $v_{12A} = 3560$		(Equation 13-15, 13-16, 13-18, or 13-19)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	7986	4600	Yes

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 39.8 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable,	$M_S = 1.393$	
Space mean speed in ramp influence area,	$S_R = 36.9$	mph
Space mean speed in outer lanes,	$S_0 = 48.7$	mph
Space mean speed for all vehicles,	$S = 39.6$	mph