Interchange Modification Study

Appendix

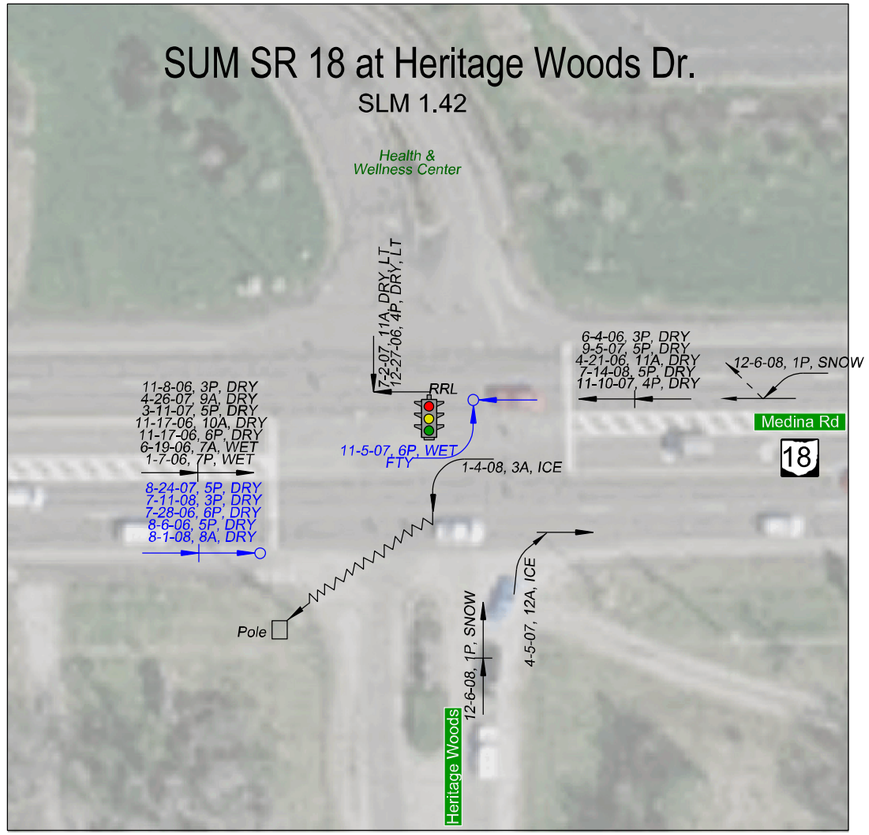
February 2012

Appendix A

Crash Analysis

SUM SR 18 at Heritage Woods Dr.

SLM 1.42



Vehicle Direction	Injury	Road:	FTC = Failure To Control	FREQUENCY		CRASH SEVERITY	
Backing	Fatal	D = Dry	FTS = Failure To Stop	0	2006	1	NON - INJURY
Pedestrian	Fixed Object	W = Wet	FTY = Failure To Yeild	1	2007	0	INJURY OR FATAL
Out of Control	Parked Vehicle	I = Ice	LOC = Left of Center	0	2008	1	TOTAL
Overturn	TEXT Date, Time, Road Way	S = Snow	RRL = Ran Red Light				

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

N

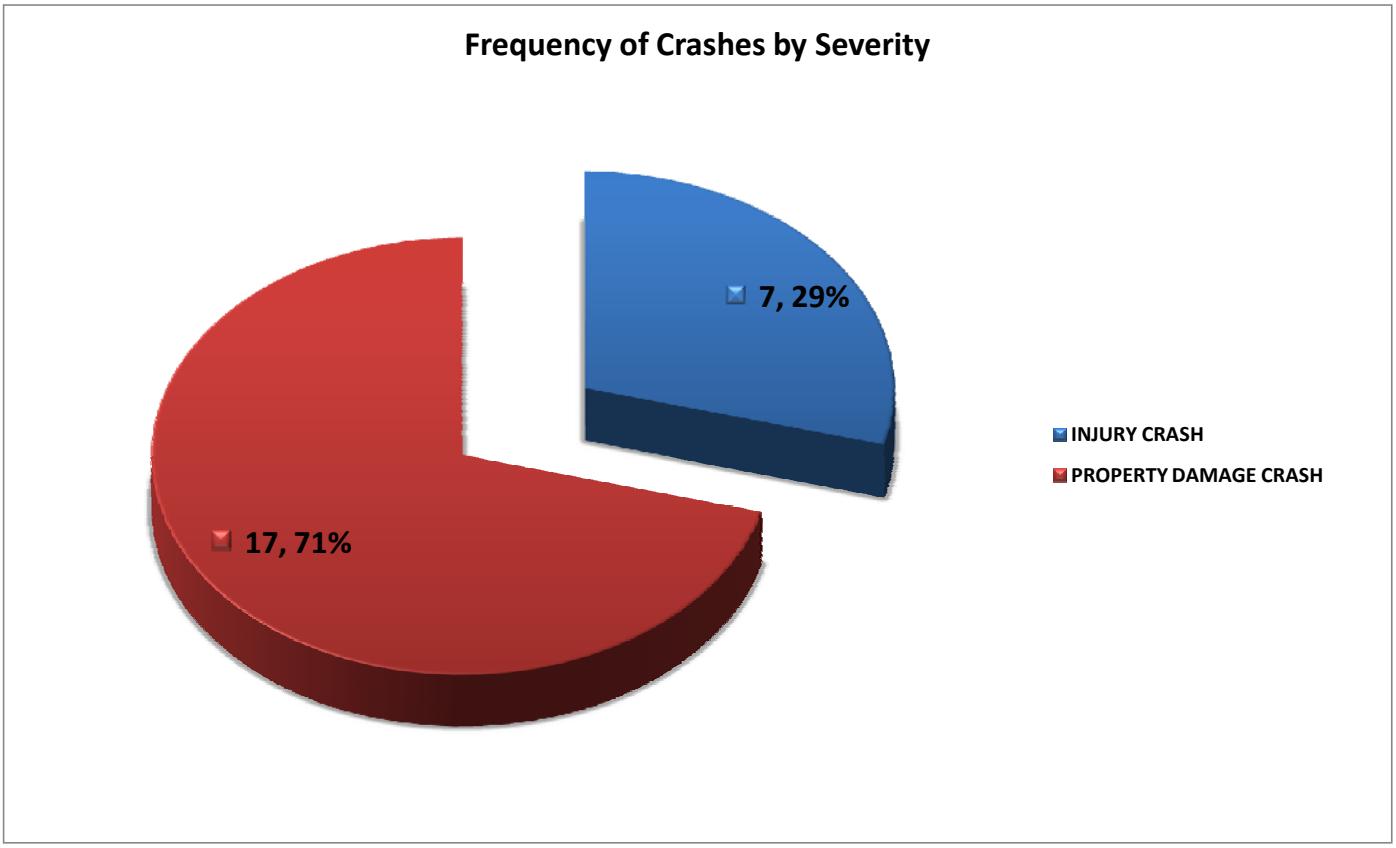
COLLISION DIAGRAM

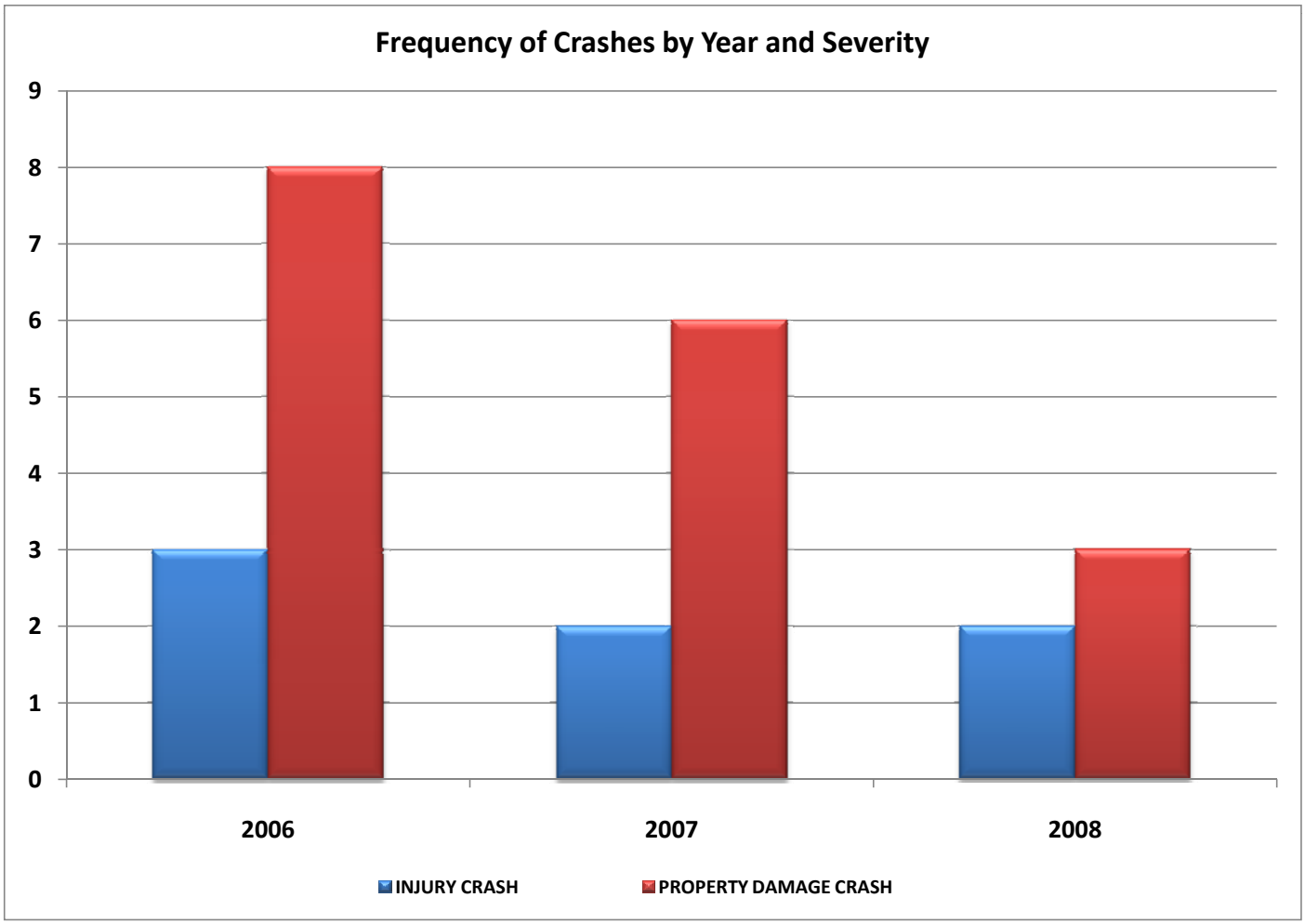
SUM SR 18

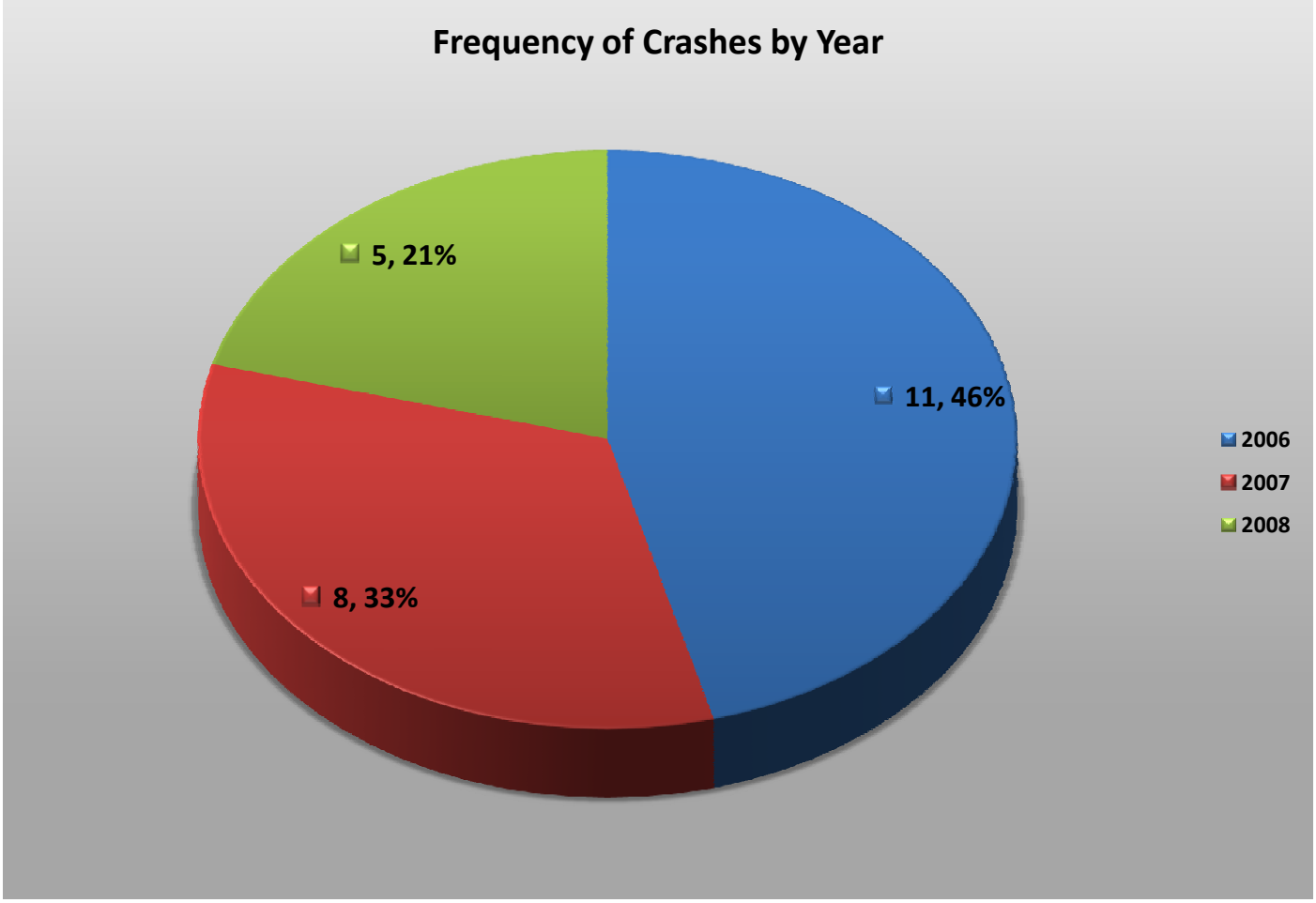
SLM 1.35 - 1.48

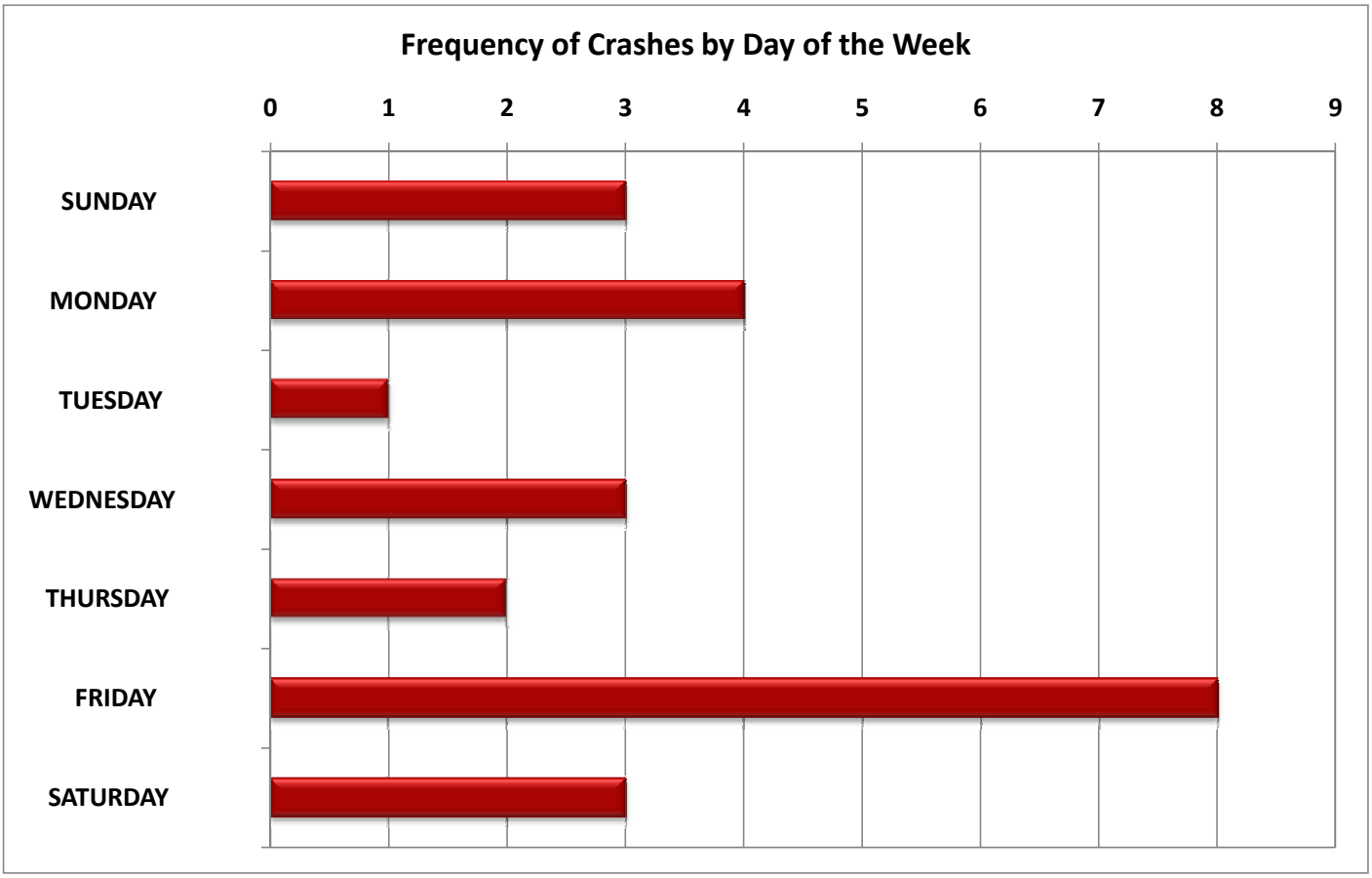
2006 - 2008

SUM-SR 18R - (SLM 1.42) From 01/01/2006 to 12/31/2008

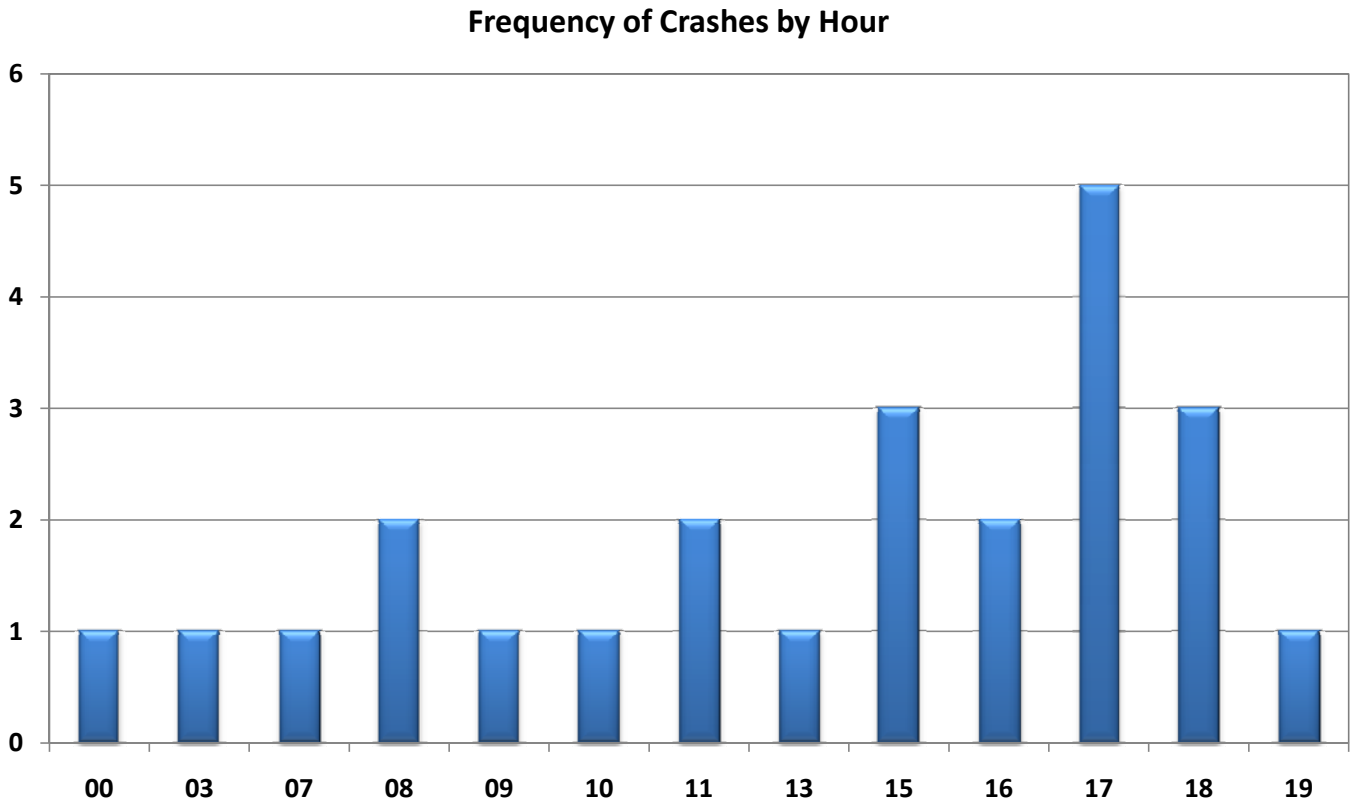


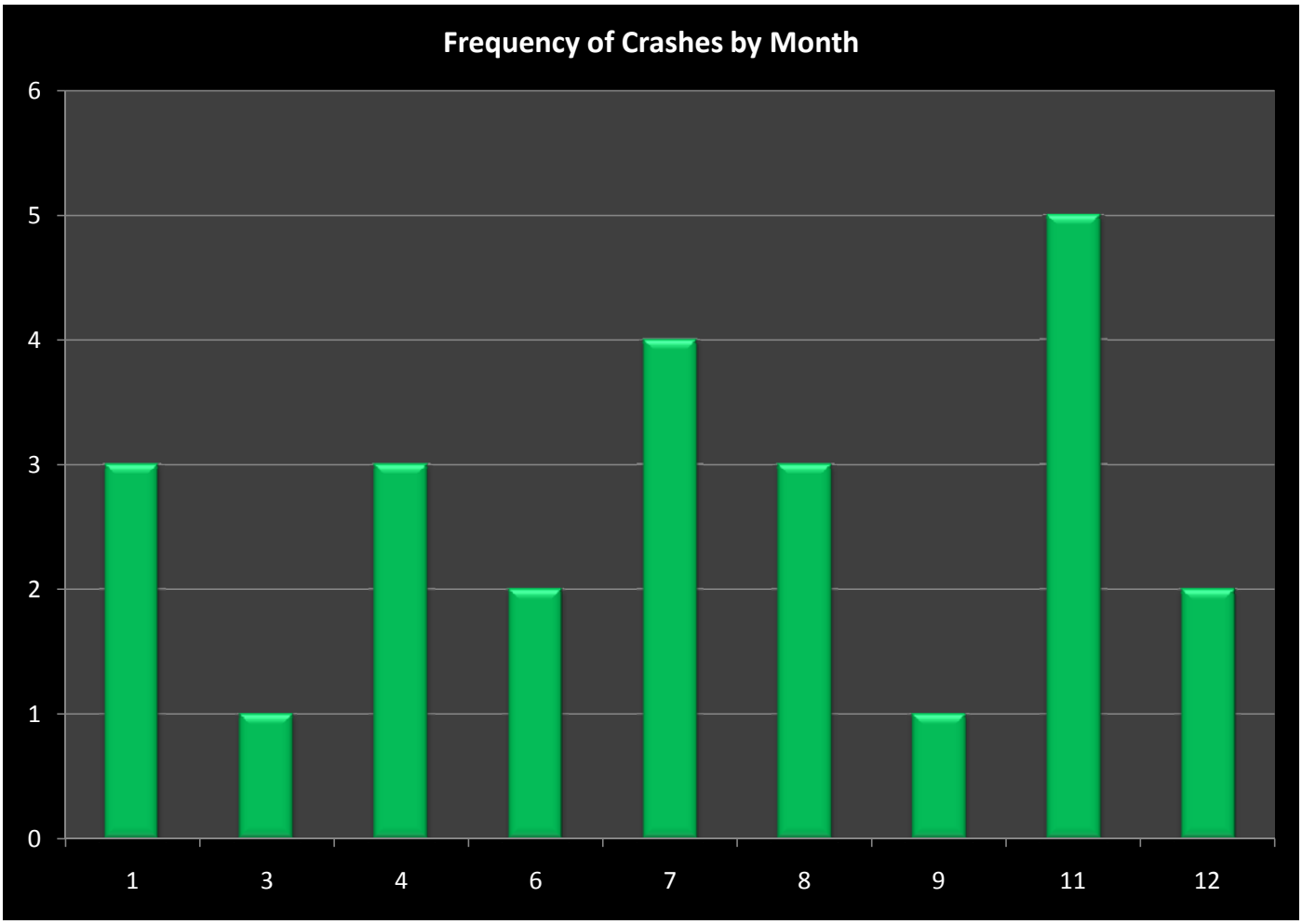



Frequency of Crashes by Year
5, 21%
11, 46%
8, 33%
2006
2007
2008

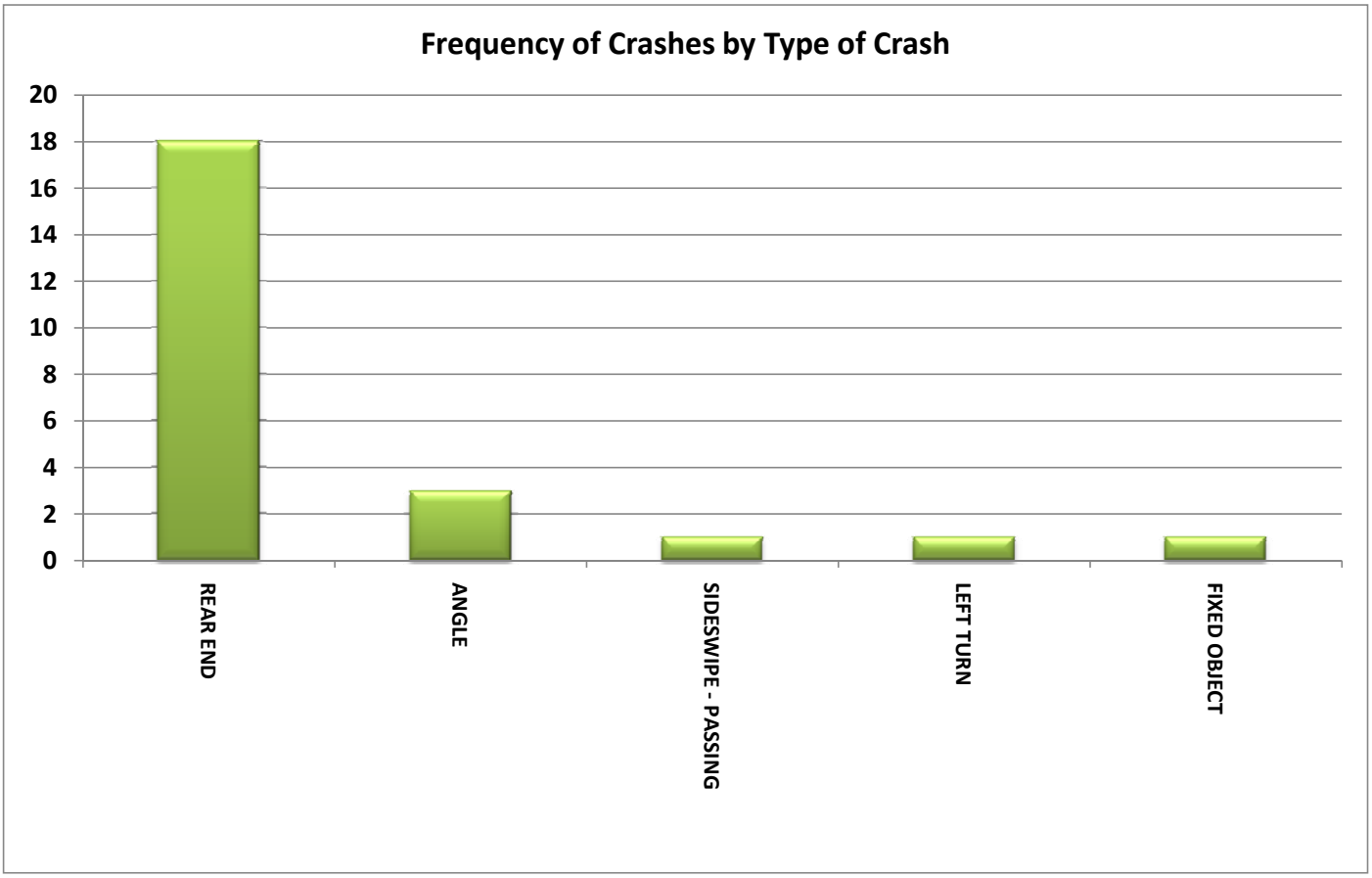

Frequency of Crashes by Day of the Week
0
1
2
3
4
5
6
7
8
9
SUNDAY
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY

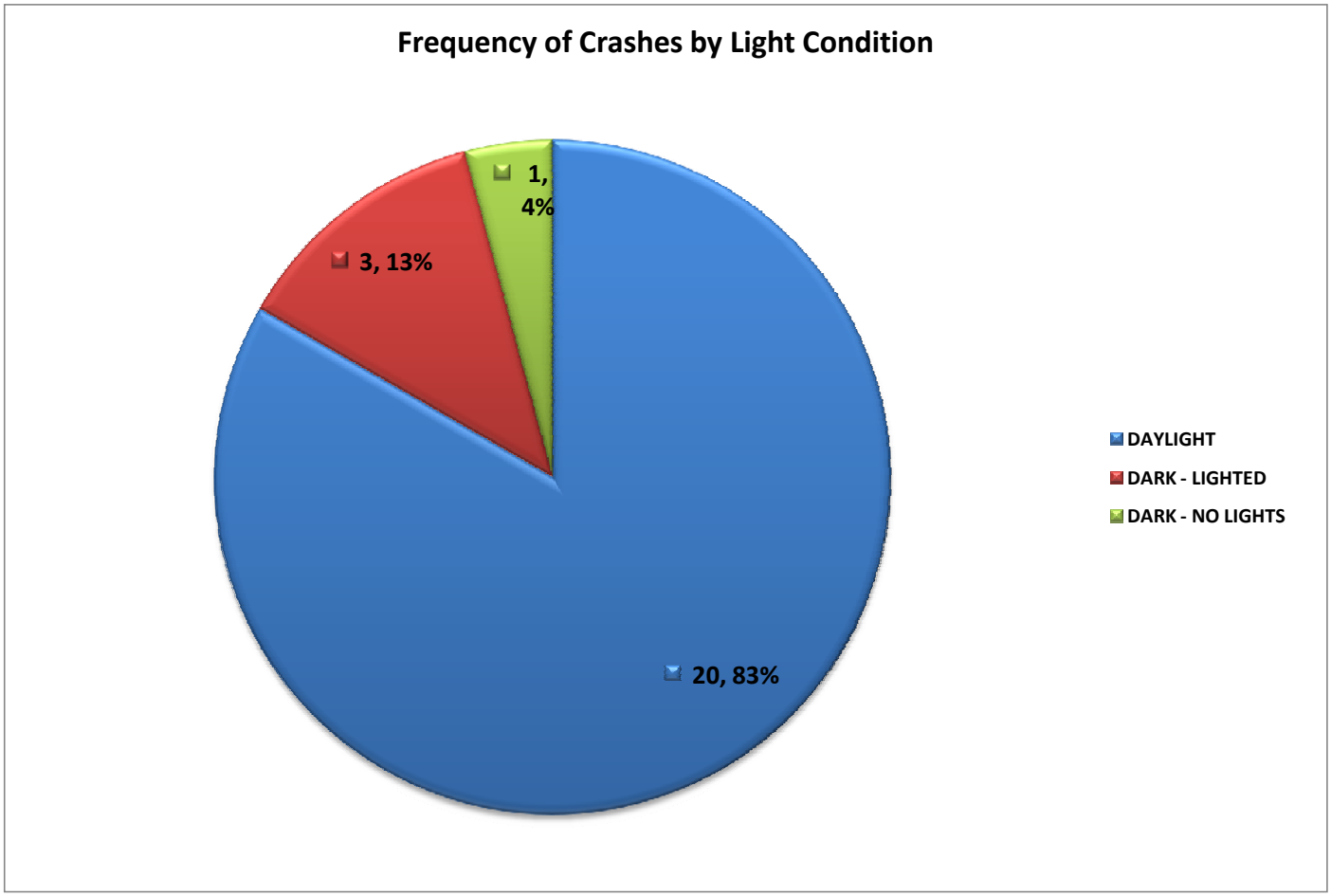
SUM-SR 18R - (SLM 1.42) From 01/01/2006 to 12/31/2008



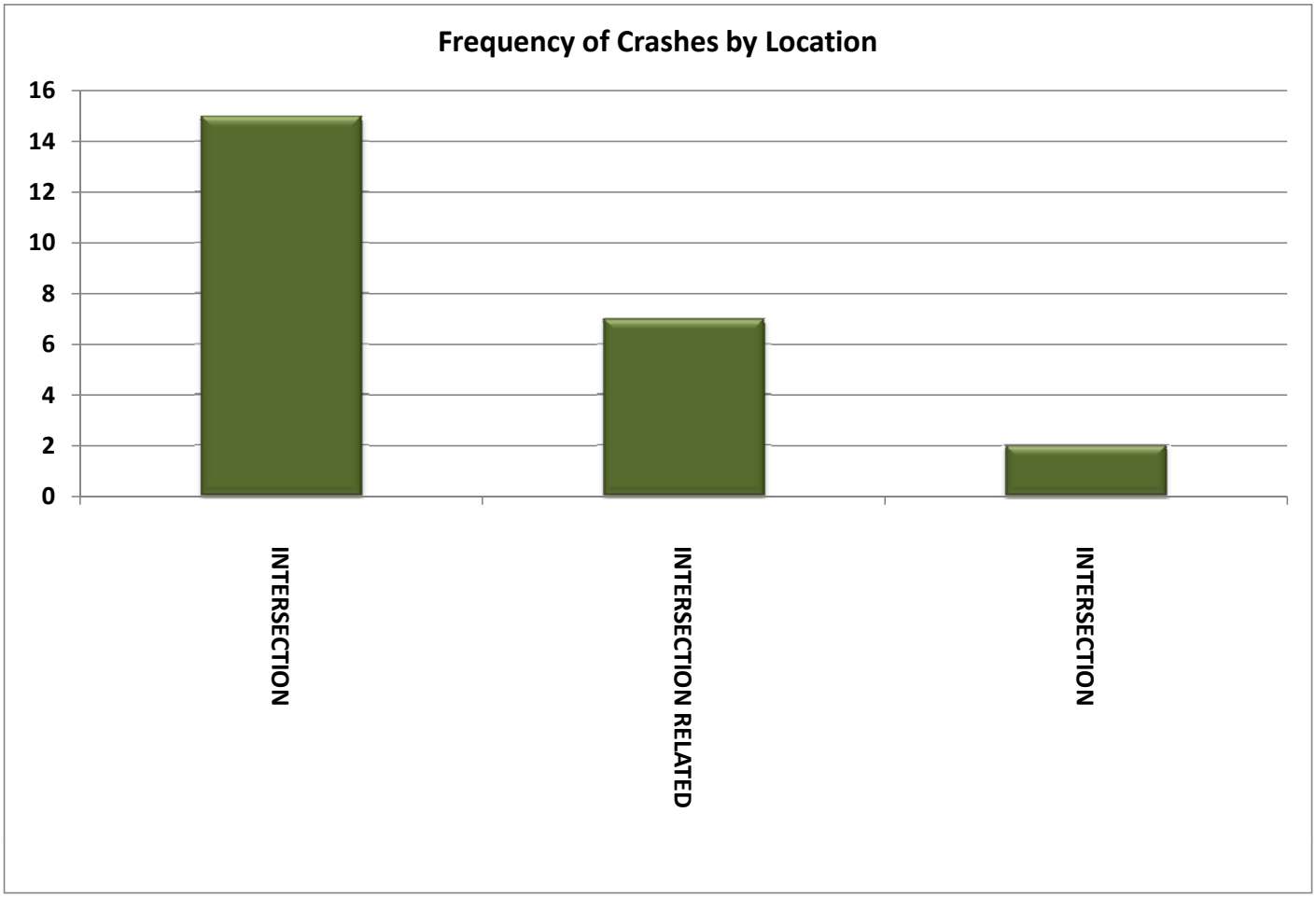


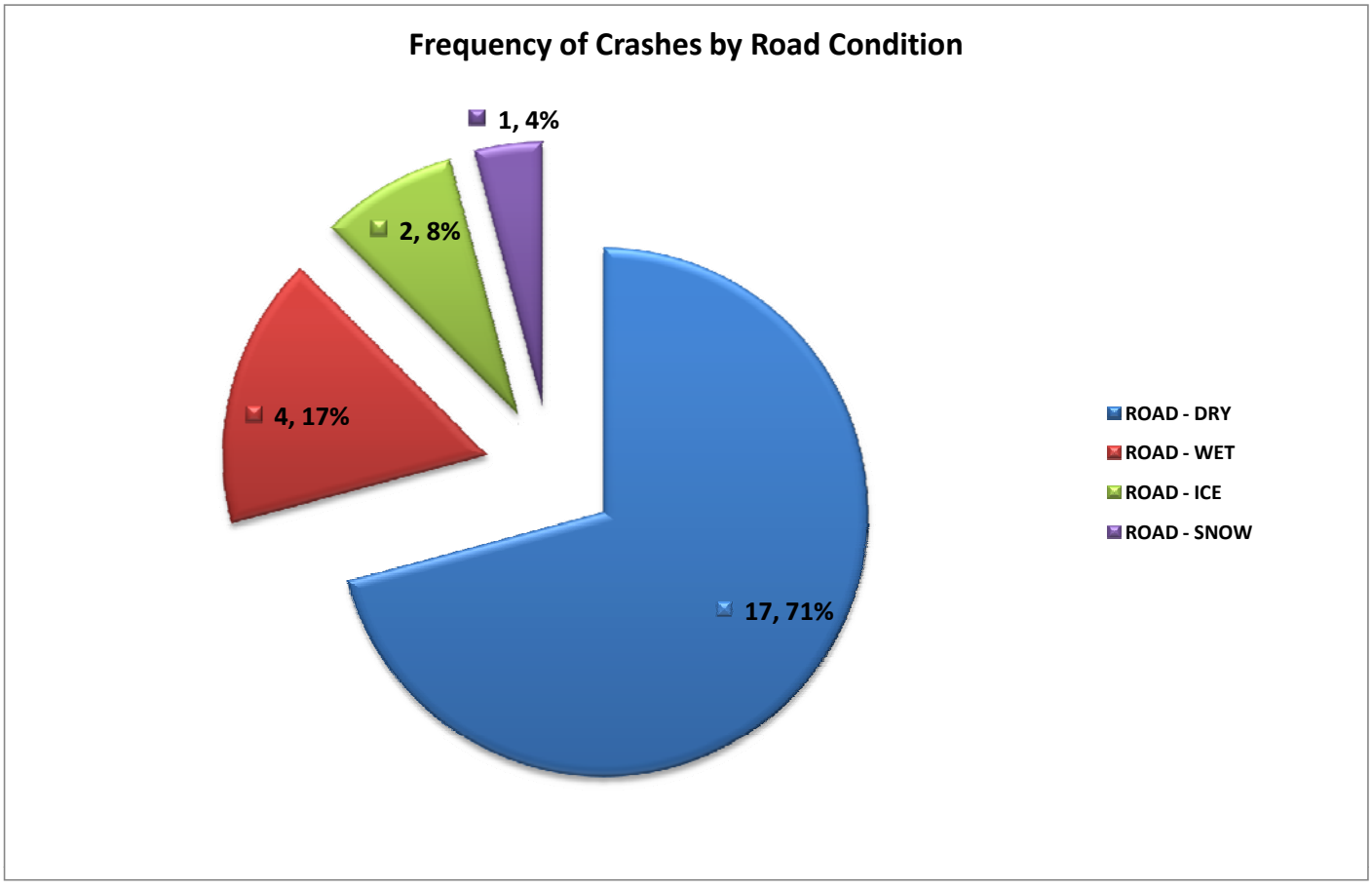
SUM-SR 18R - (SLM 1.42) From 01/01/2006 to 12/31/2008

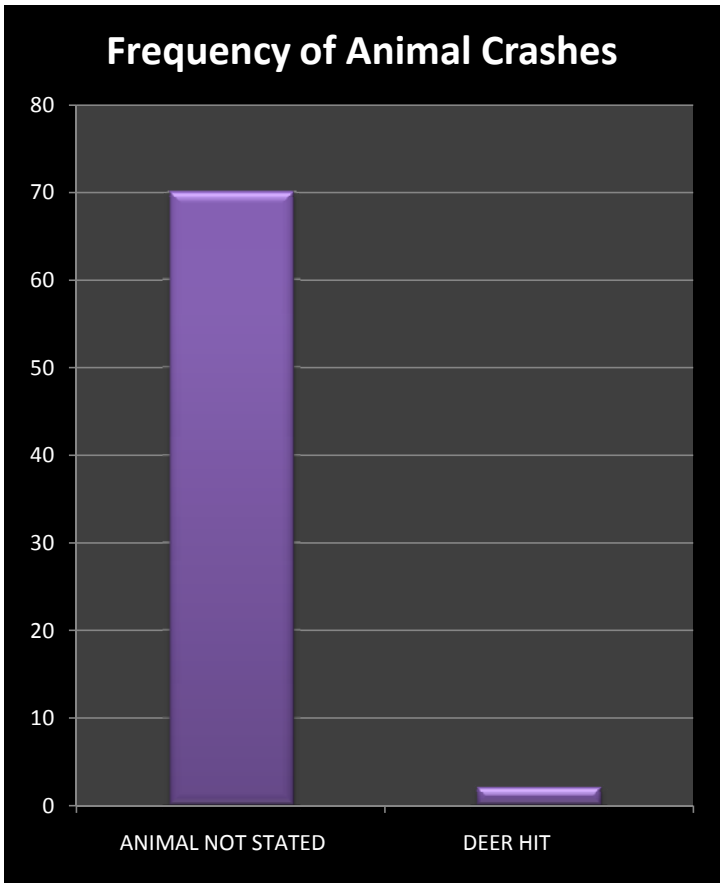


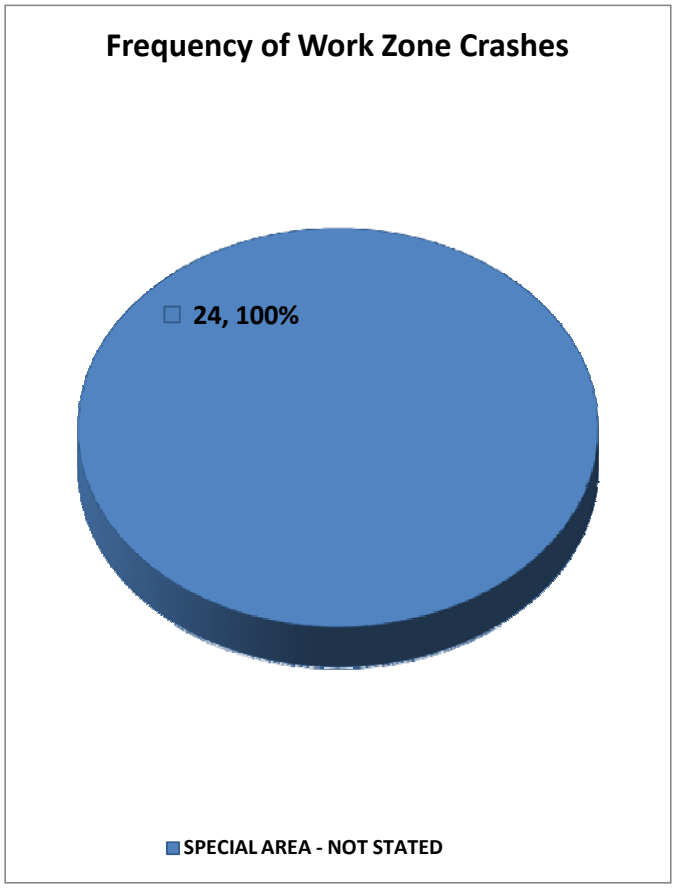


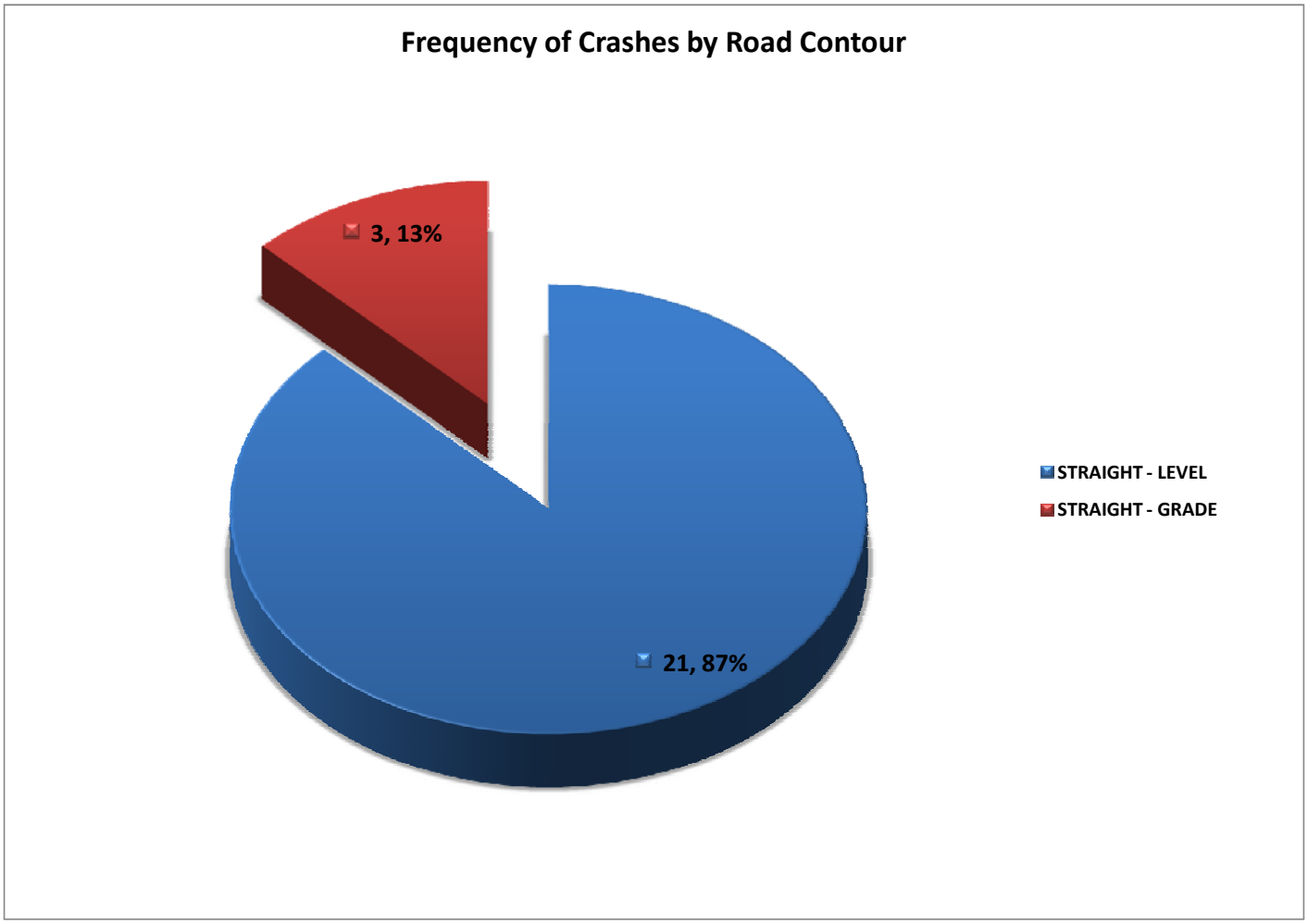
SUM-SR 18R - (SLM 1.42) From 01/01/2006 to 12/31/2008

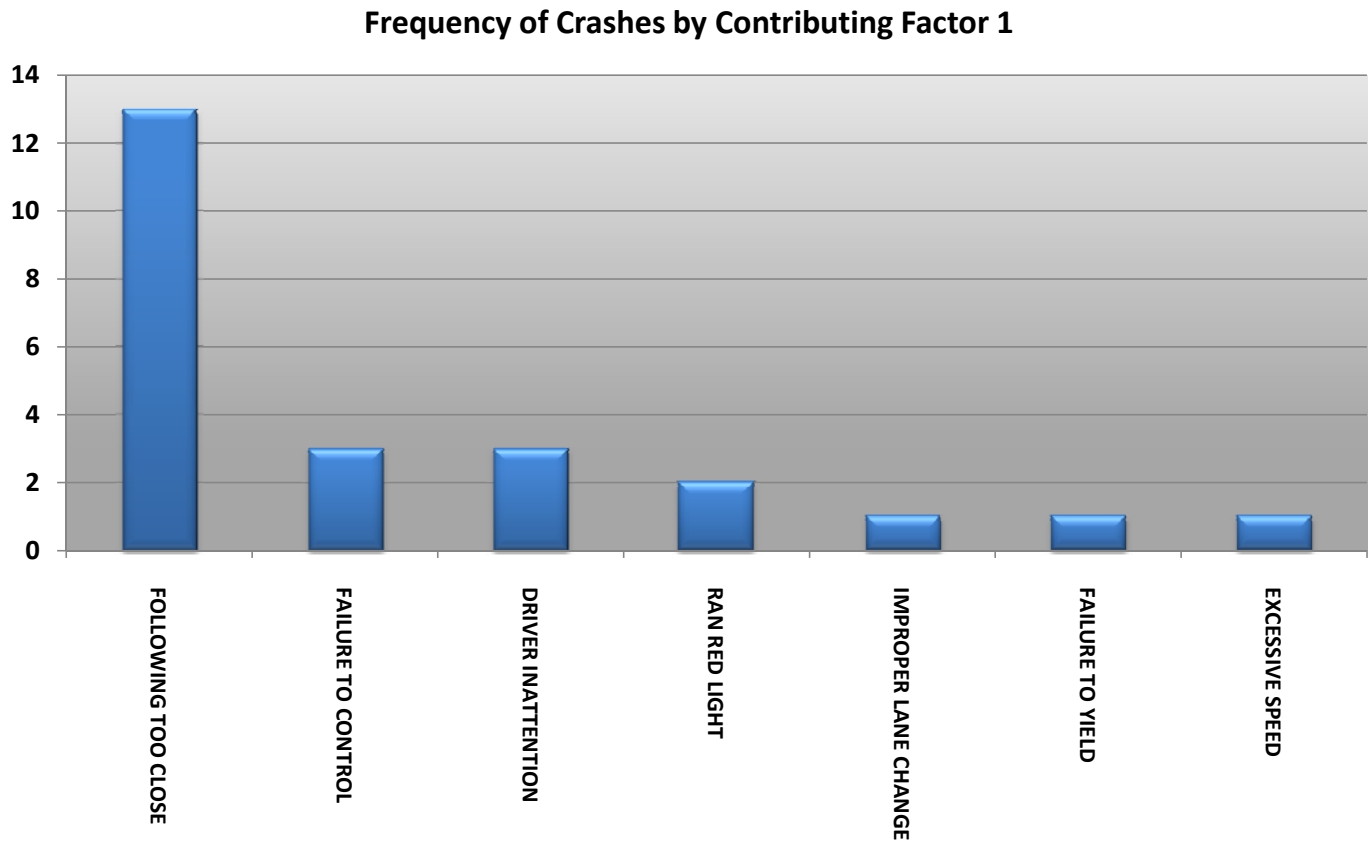


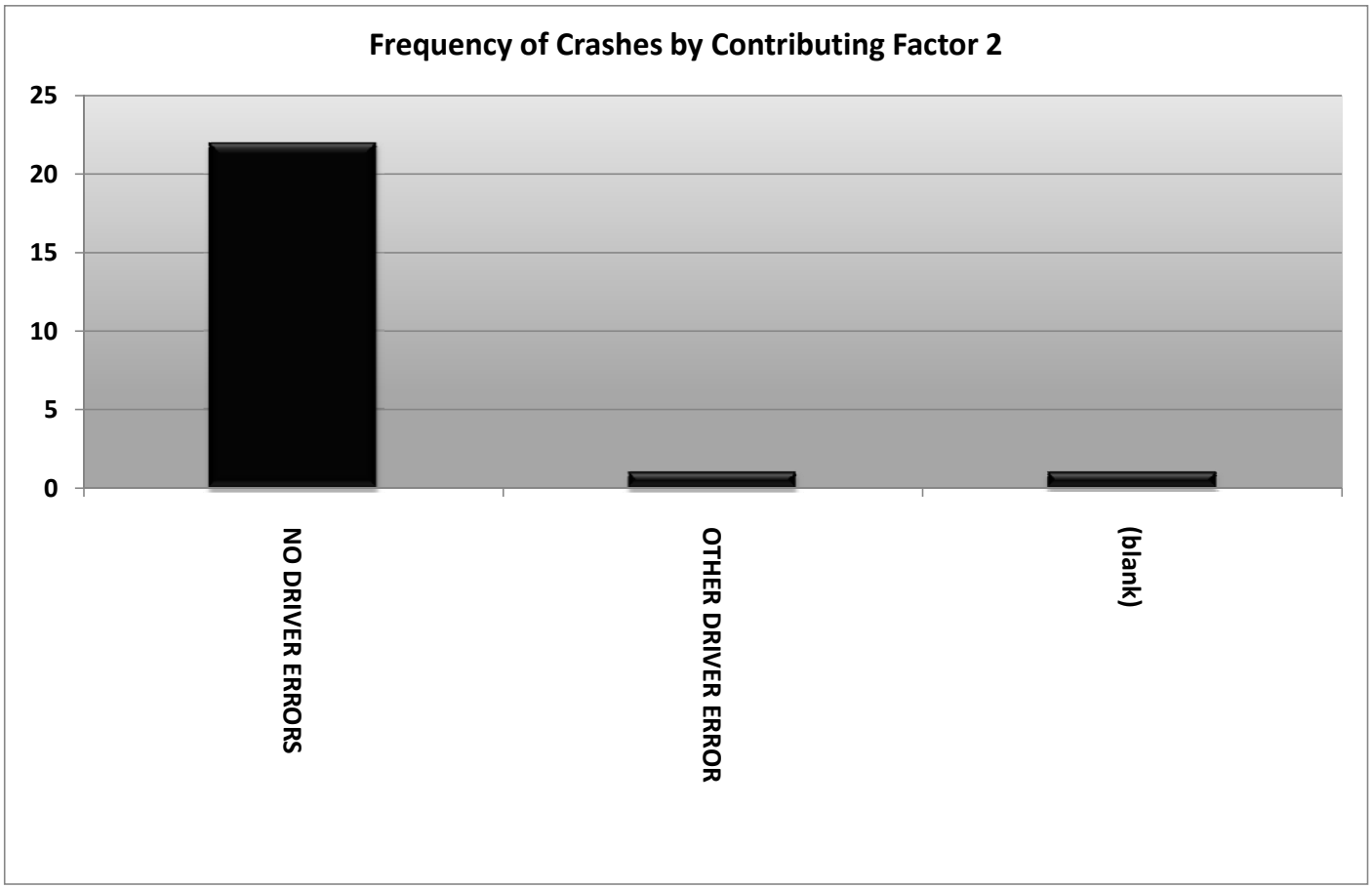


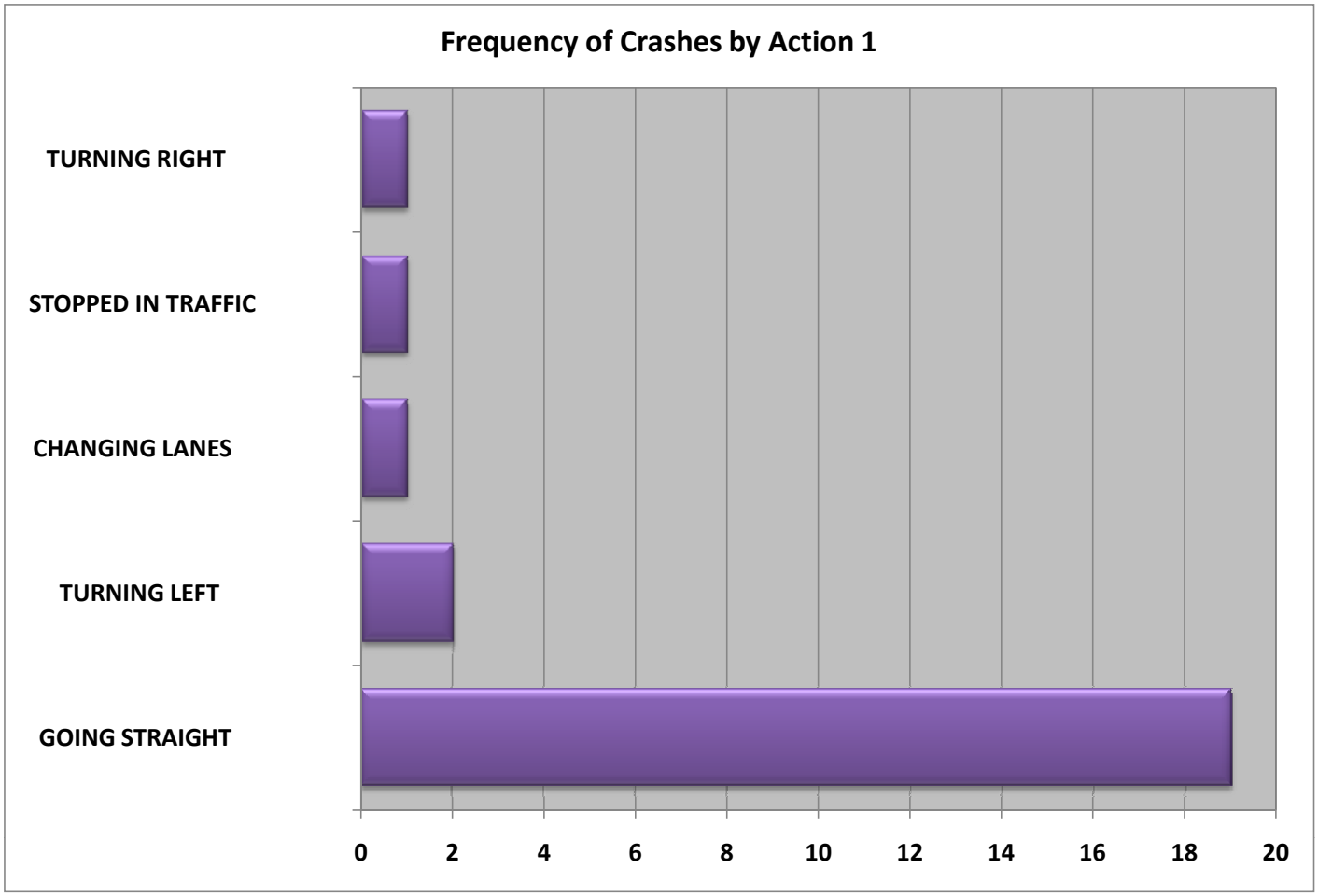

Frequency of Animal Crashes
80
70
60
50
40
30
20
10
0
ANIMAL NOT STATED
DEER HIT

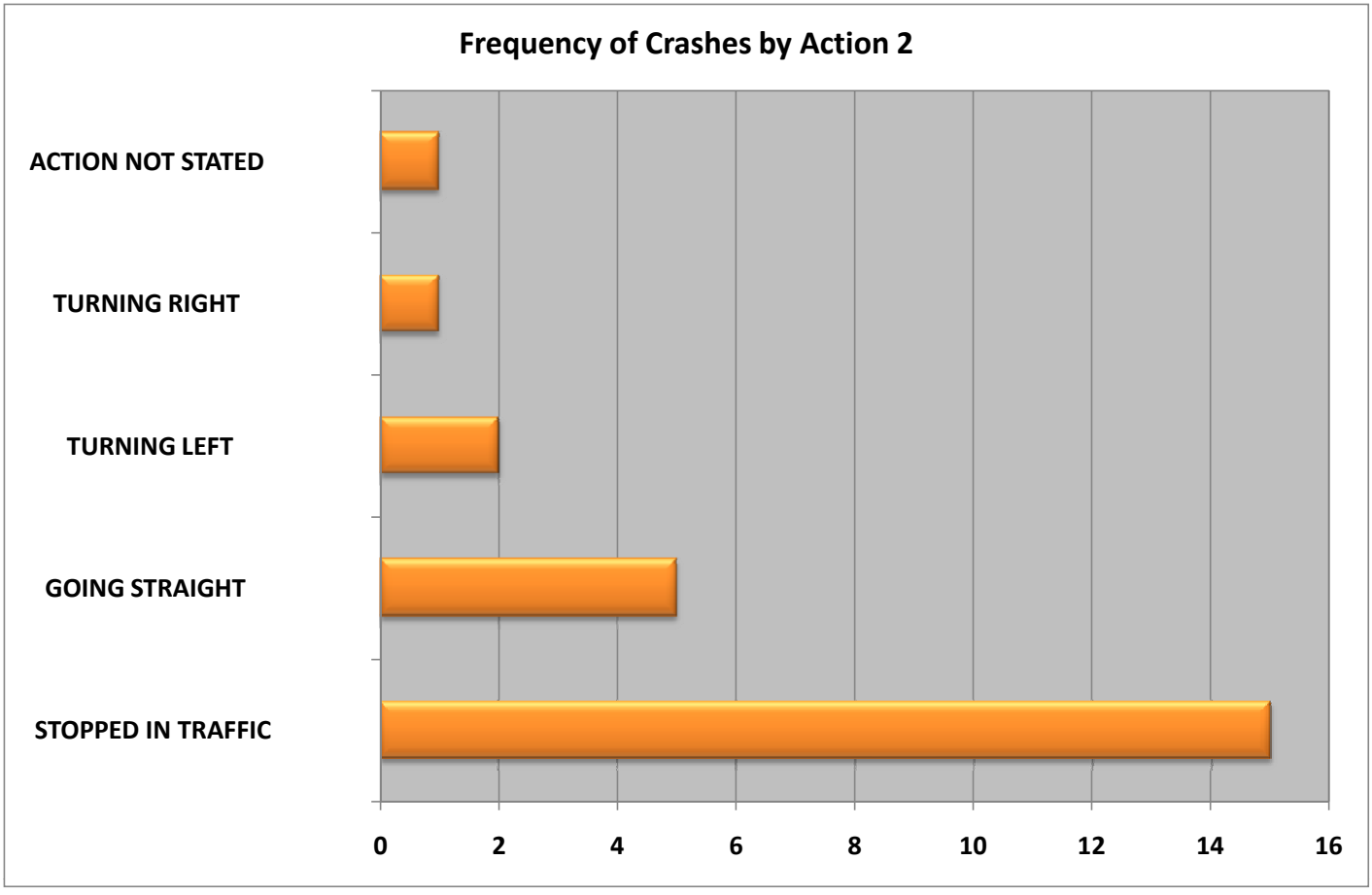

Frequency of Work Zone Crashes
24, 100%
SPECIAL AREA - NOT STATED

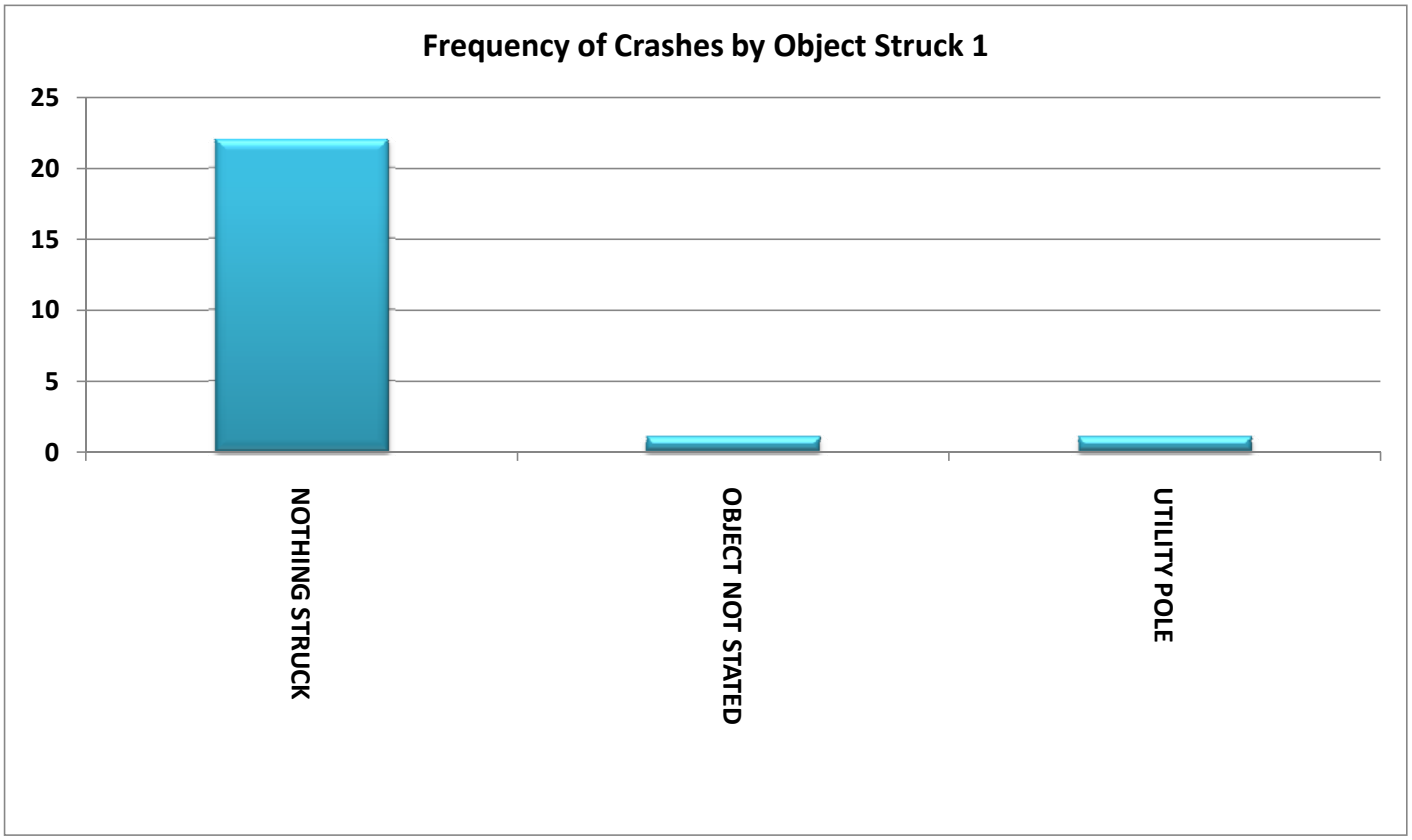

Frequency of Crashes by Road Contour
3, 13%
21, 87%
STRAIGHT - LEVEL
STRAIGHT - GRADE

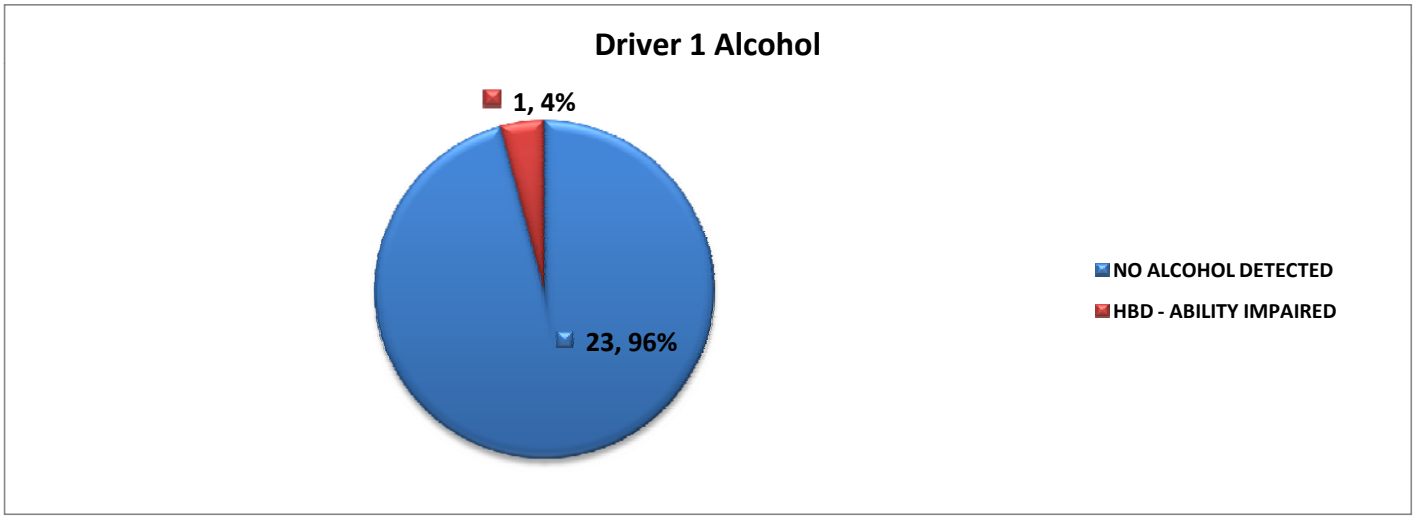

Frequency of Crashes by Contributing Factor 1
14
12
10
8
6
4
2
0
FOLLOWING TOO CLOSE
FAILURE TO CONTROL
DRIVER INATTENTION
RAN RED LIGHT
IMPROPER LANE CHANGE
FAILURE TO YIELD
EXCESSIVE SPEED

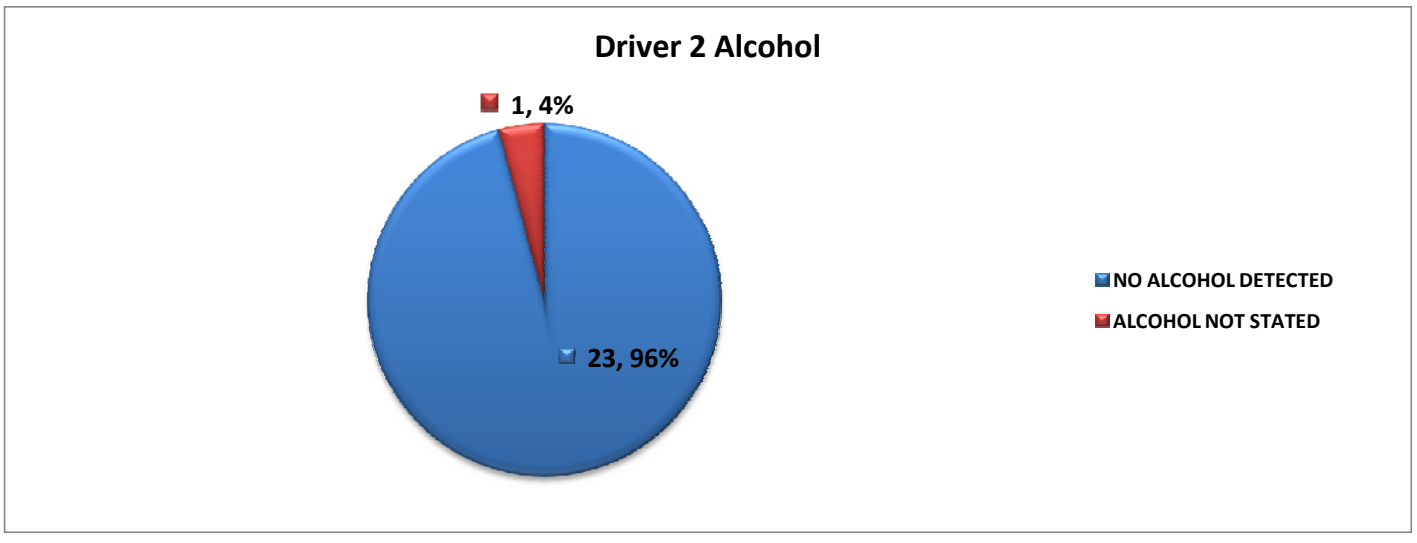

Frequency of Crashes by Contributing Factor 2
25
20
15
10
5
0
NO DRIVER ERRORS
OTHER DRIVER ERROR
(blank)

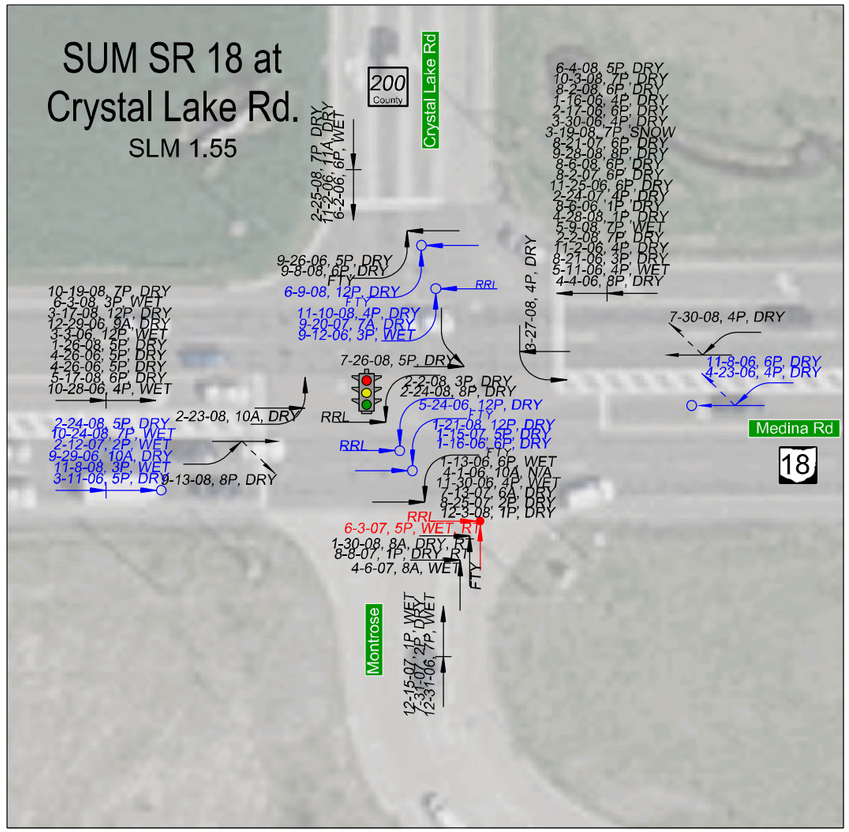

Frequency of Crashes by Action 1
TURNING RIGHT
STOPPED IN TRAFFIC
CHANGING LANES
TURNING LEFT
GOING STRAIGHT
0
2
4
6
8
10
12
14
16
18
20

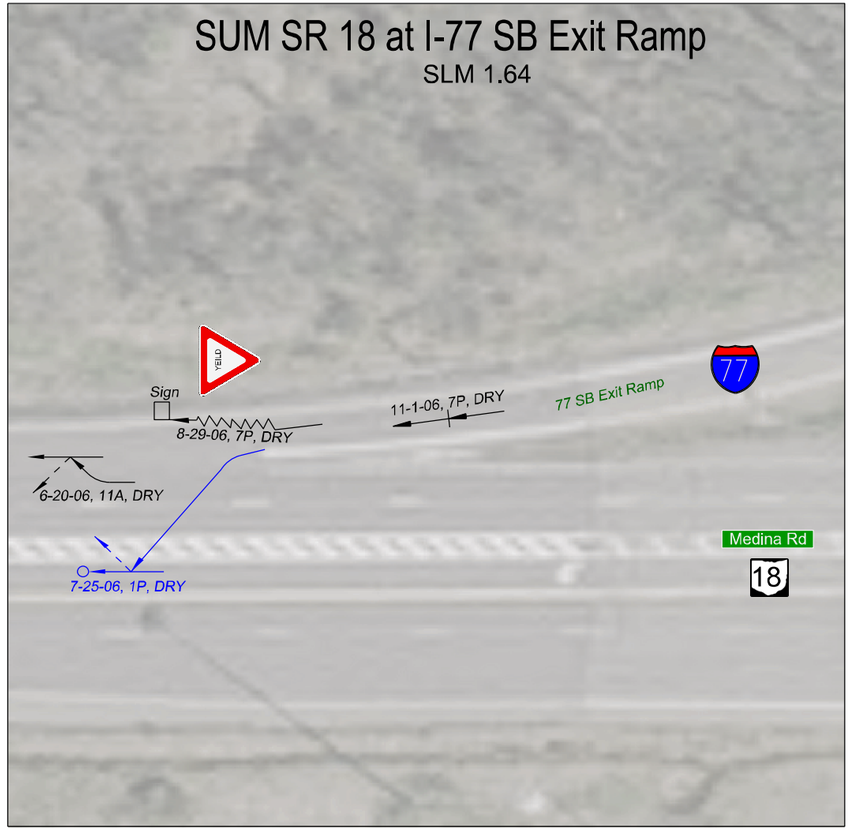

Frequency of Crashes by Action 2
ACTION NOT STATED
TURNING RIGHT
TURNING LEFT
GOING STRAIGHT
STOPPED IN TRAFFIC
0
2
4
6
8
10
12
14
16

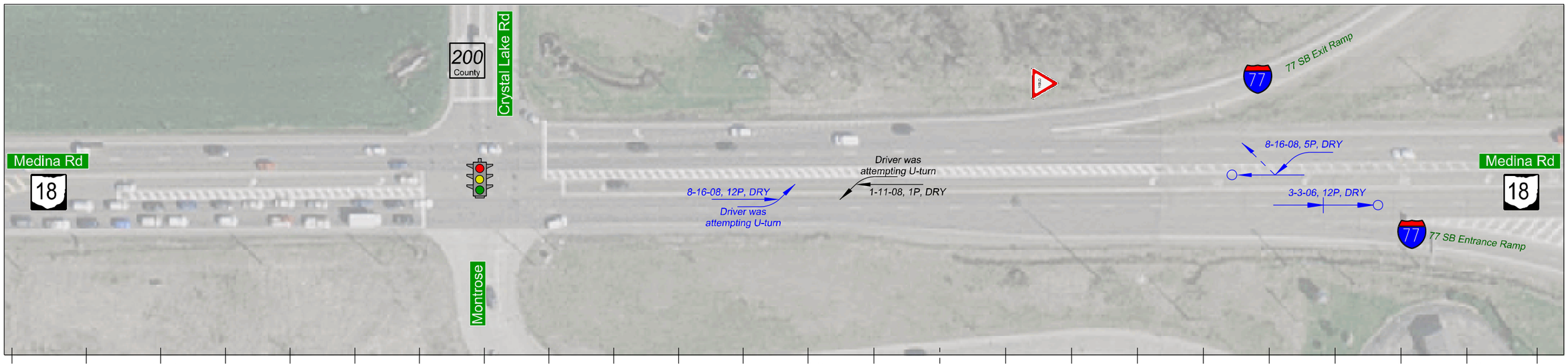

Frequency of Crashes by Object Struck 1
25
20
15
10
5
0
NOTHING STRUCK
OBJECT NOT STATED
UTILITY POLE


Driver 1 Alcohol
1, 4%
23, 96%
NO ALCOHOL DETECTED
HBD - ABILITY IMPAIRED


Driver 2 Alcohol
1, 4%
23, 96%
NO ALCOHOL DETECTED
ALCOHOL NOT STATED







Vehicle Direction	Injury	Road:	FTC = Failure To Control	FREQUENCY	CRASH SEVERITY
Backing	Fatal	D = Dry	FTS = Failure To Stop	1 2006	1 NON - INJURY
Pedestrian	Fixed Object	W = Wet	FTY = Failure To Yeild	0 2007	3 INJURY OR FATAL
Out of Control	Parked Vehicle	I = Ice	LOC = Left of Center	3 2008	4 TOTAL
Overturn	TEXT Date, Time, Road Way	S = Snow	RRL = Ran Red Light		

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

N

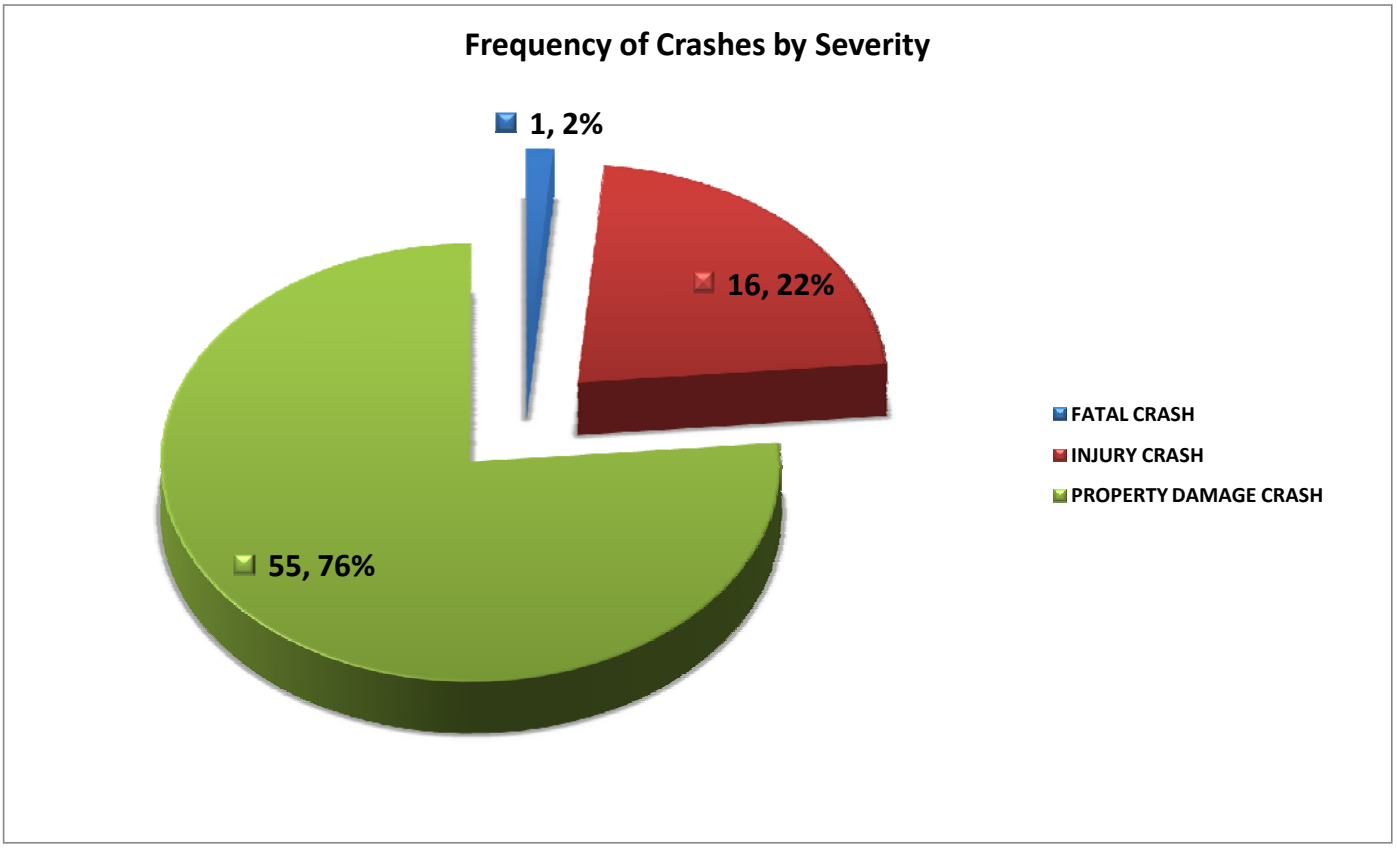
COLLISION DIAGRAM

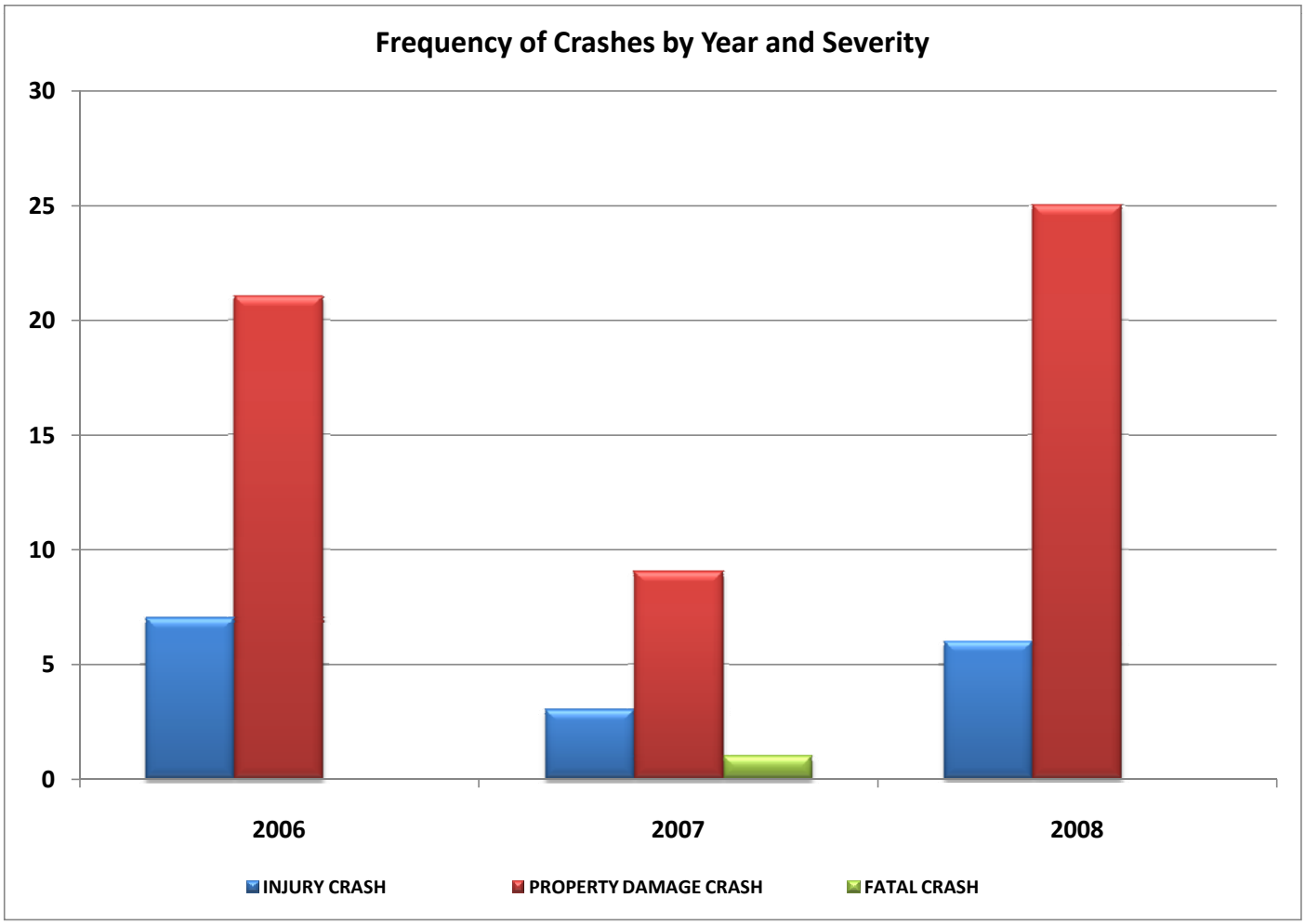
SUM SR 18

SLM 1.48 - 1.71

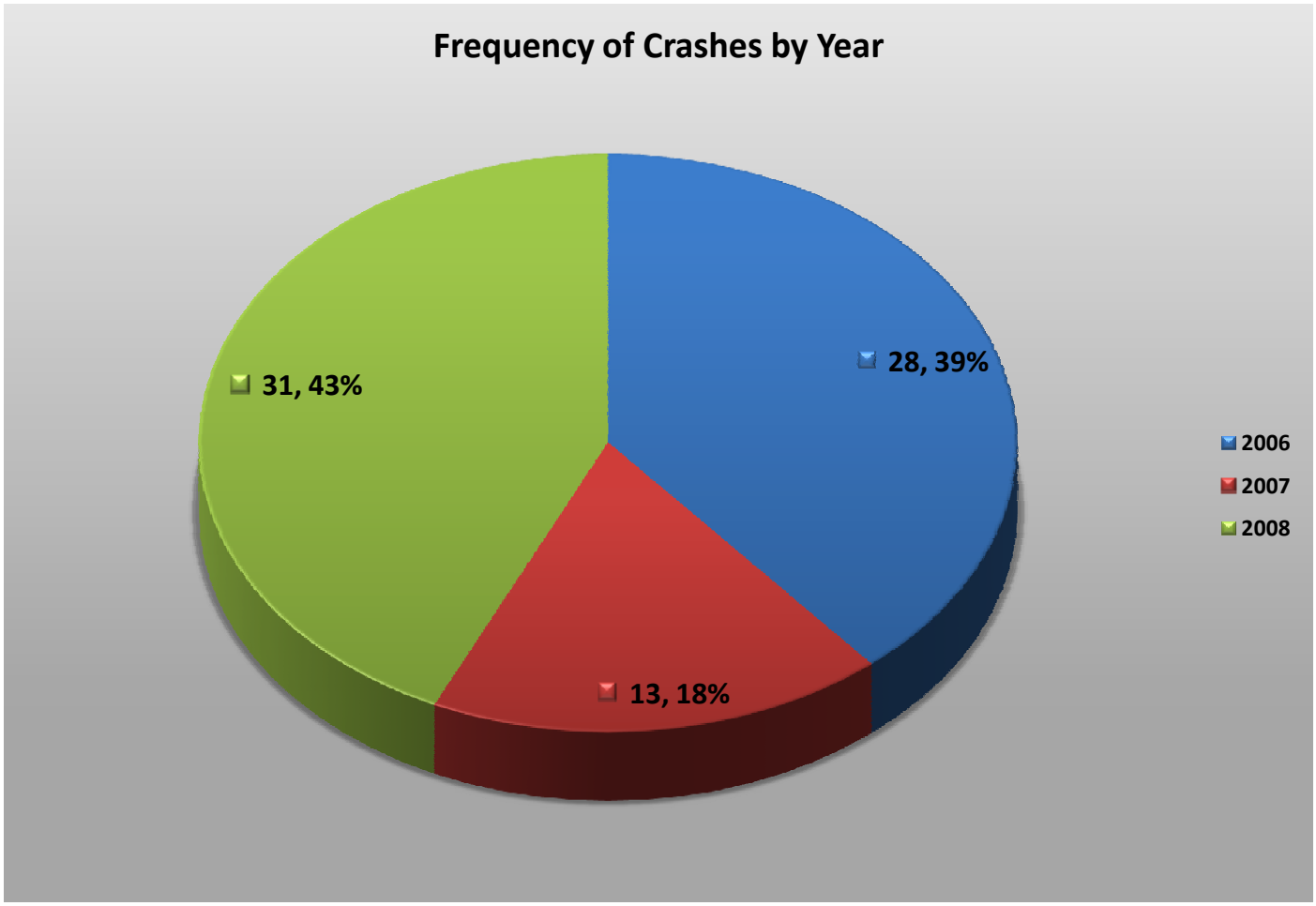
2006 - 2008

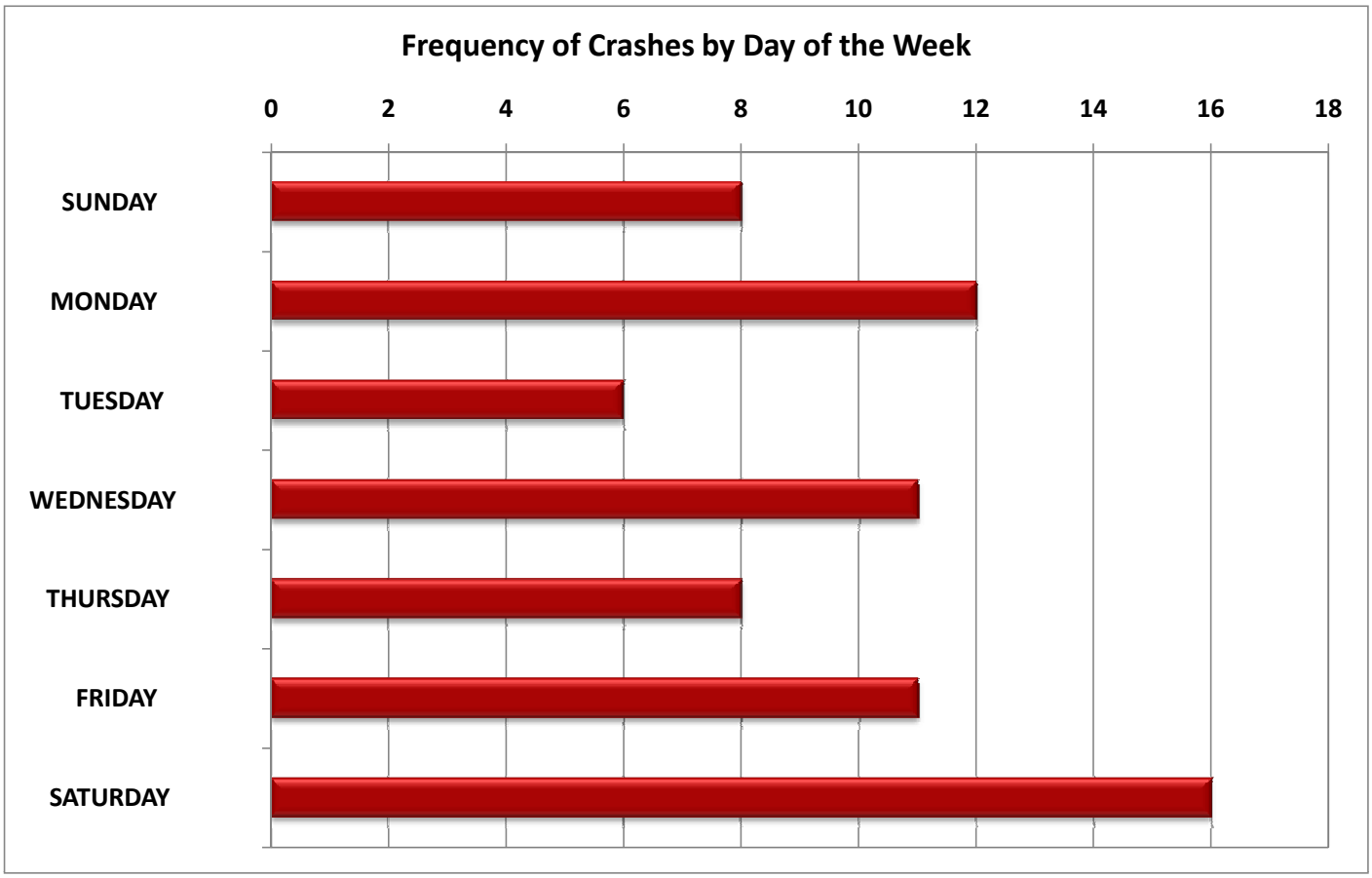
SUM-SR 18R - (SLM 1.55) From 01/01/2006 to 12/31/2008



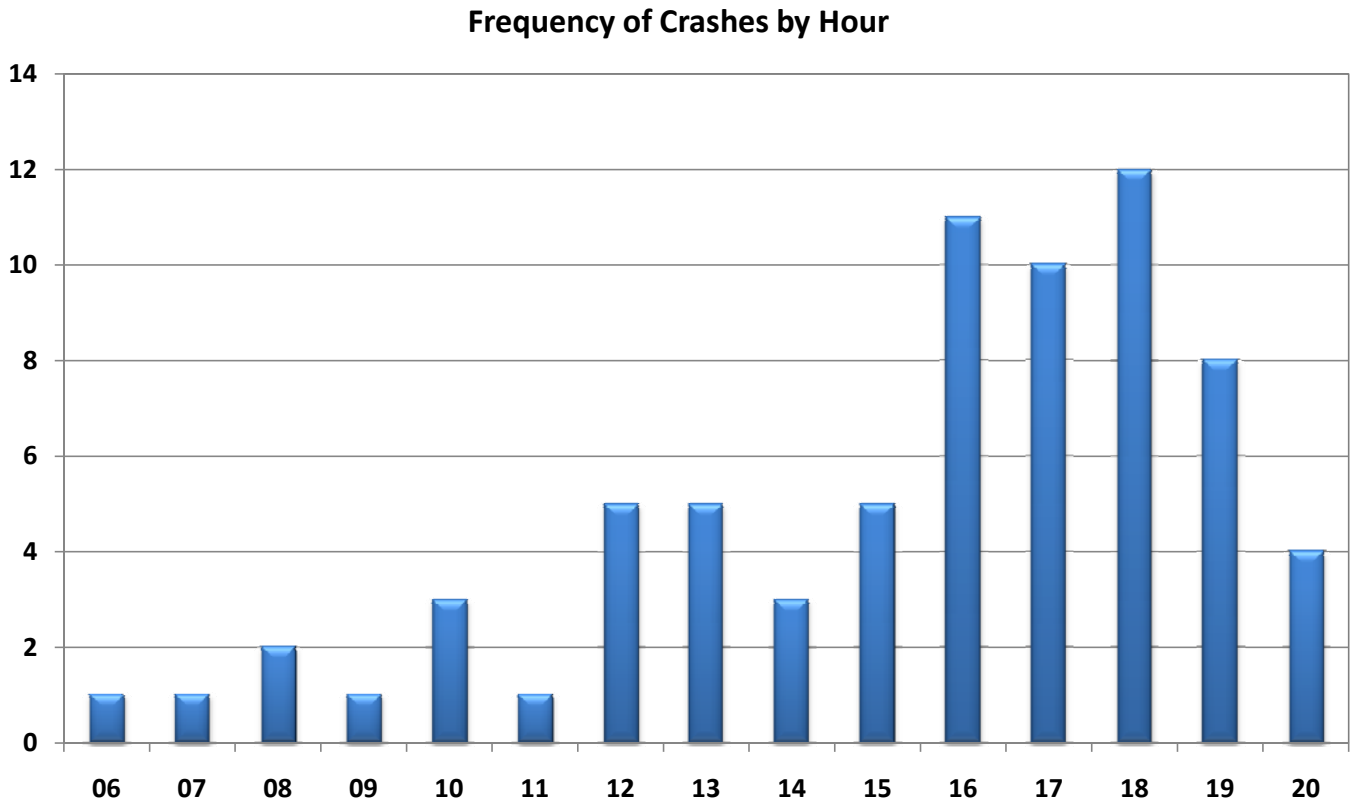


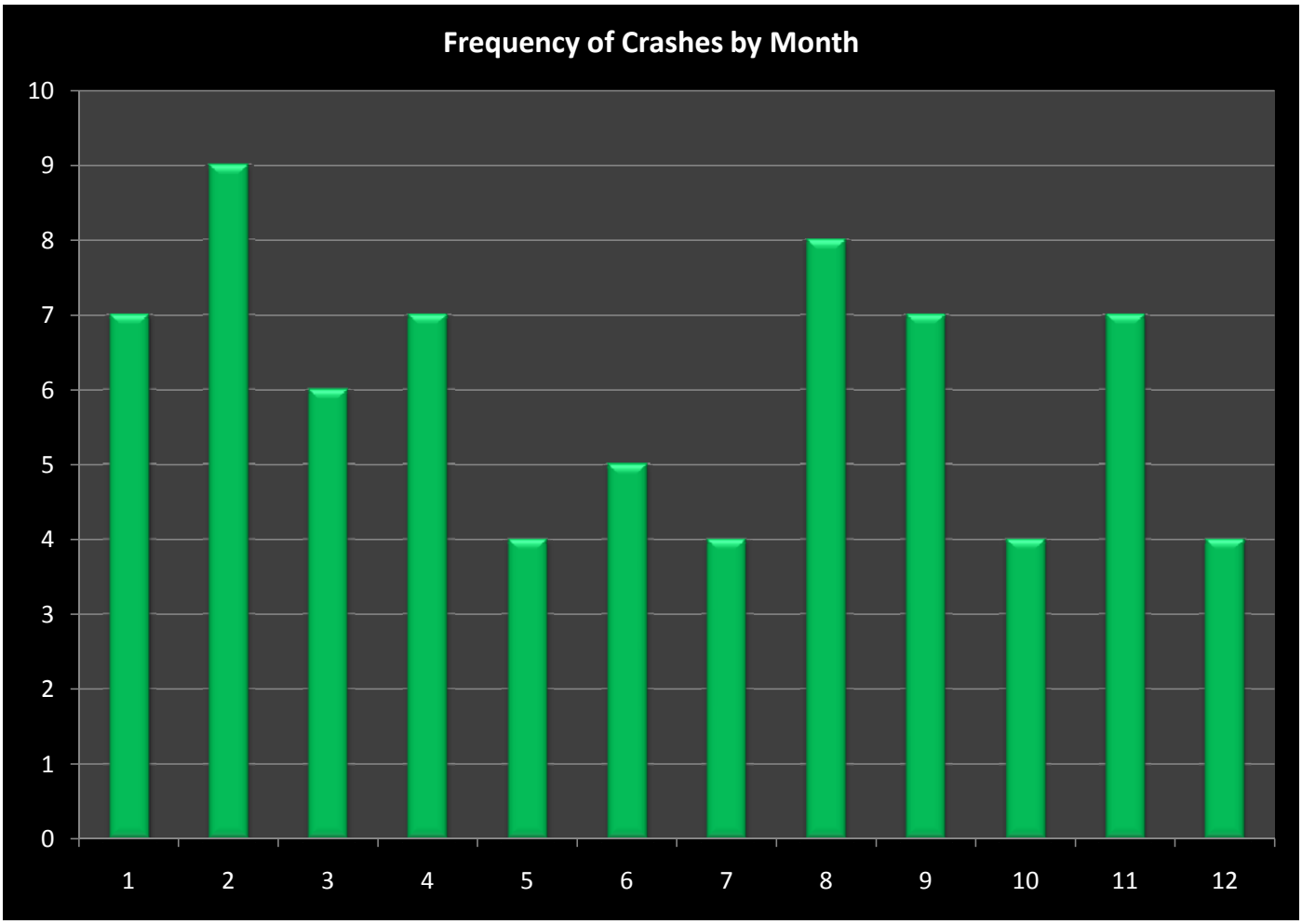
SUM-SR 18R - (SLM 1.55) From 01/01/2006 to 12/31/2008



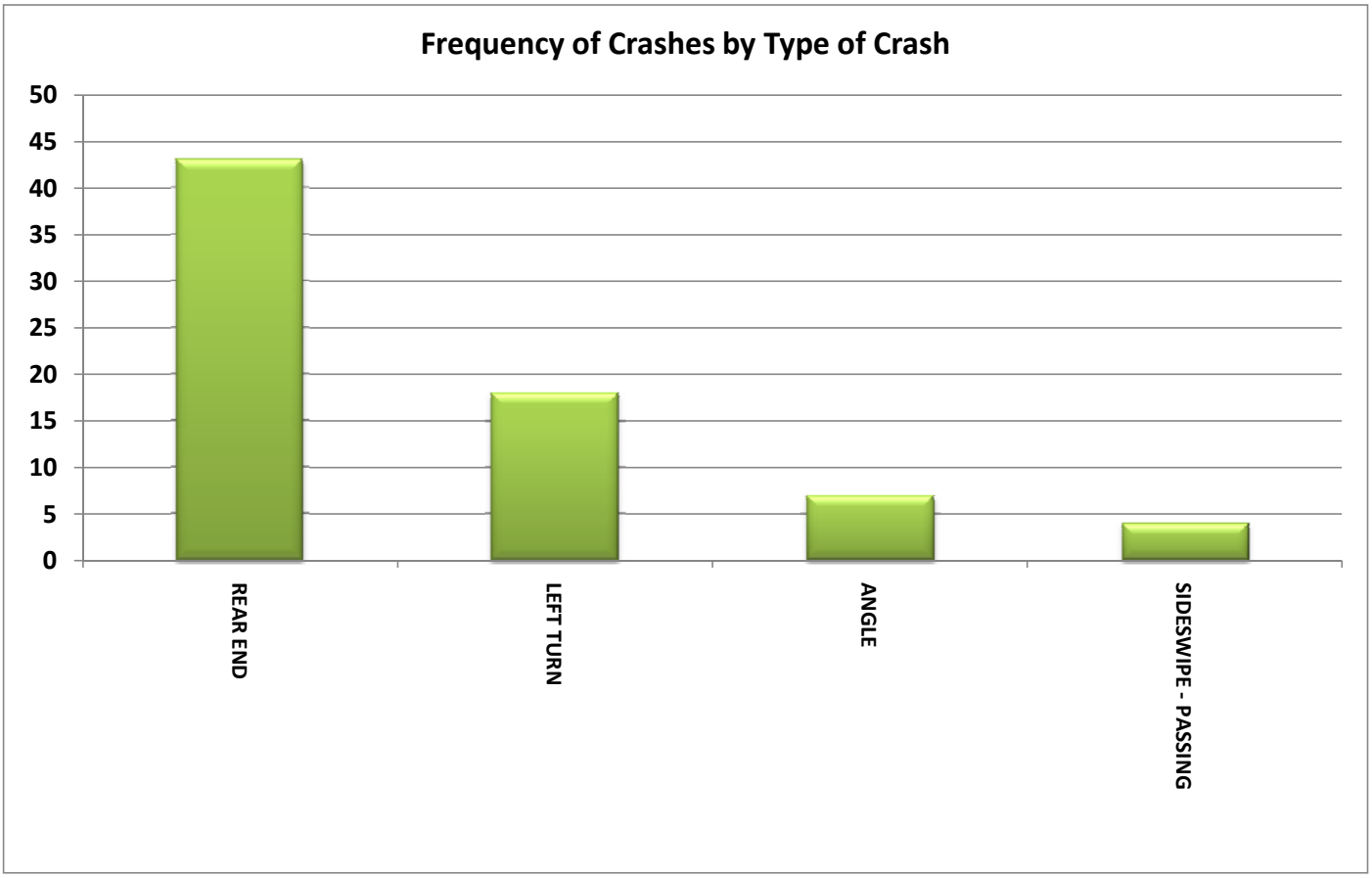


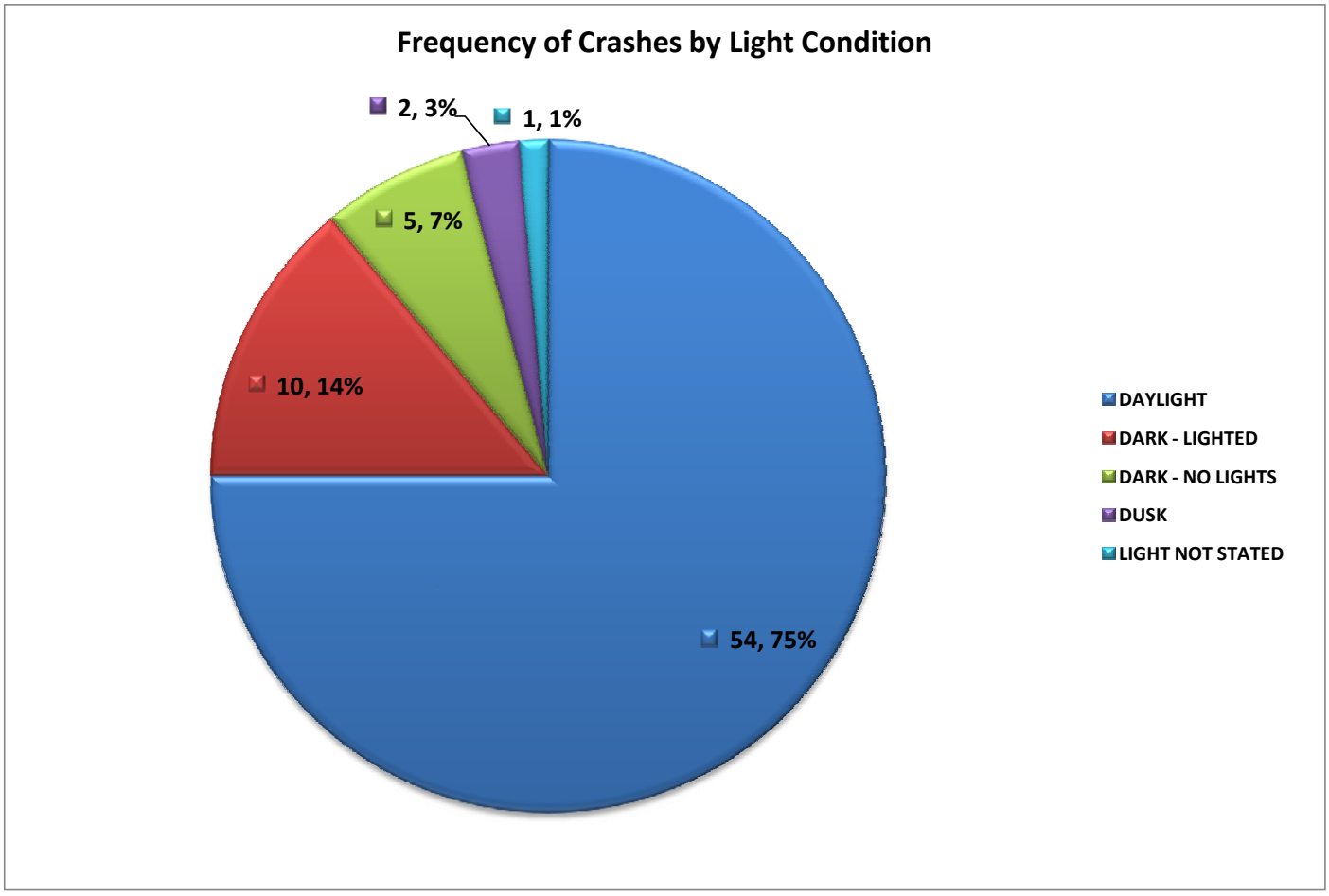
SUM-SR 18R - (SLM 1.55) From 01/01/2006 to 12/31/2008



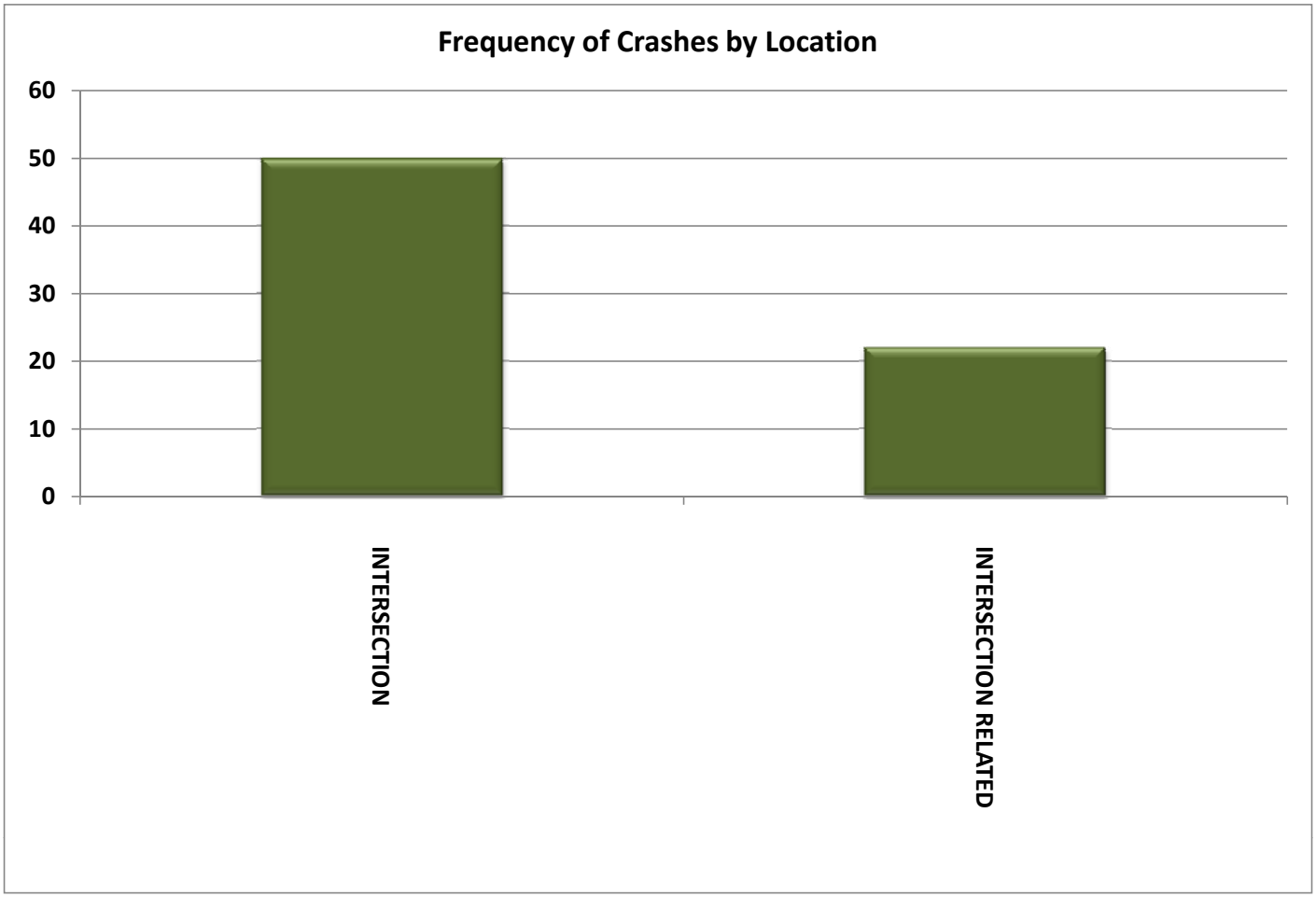


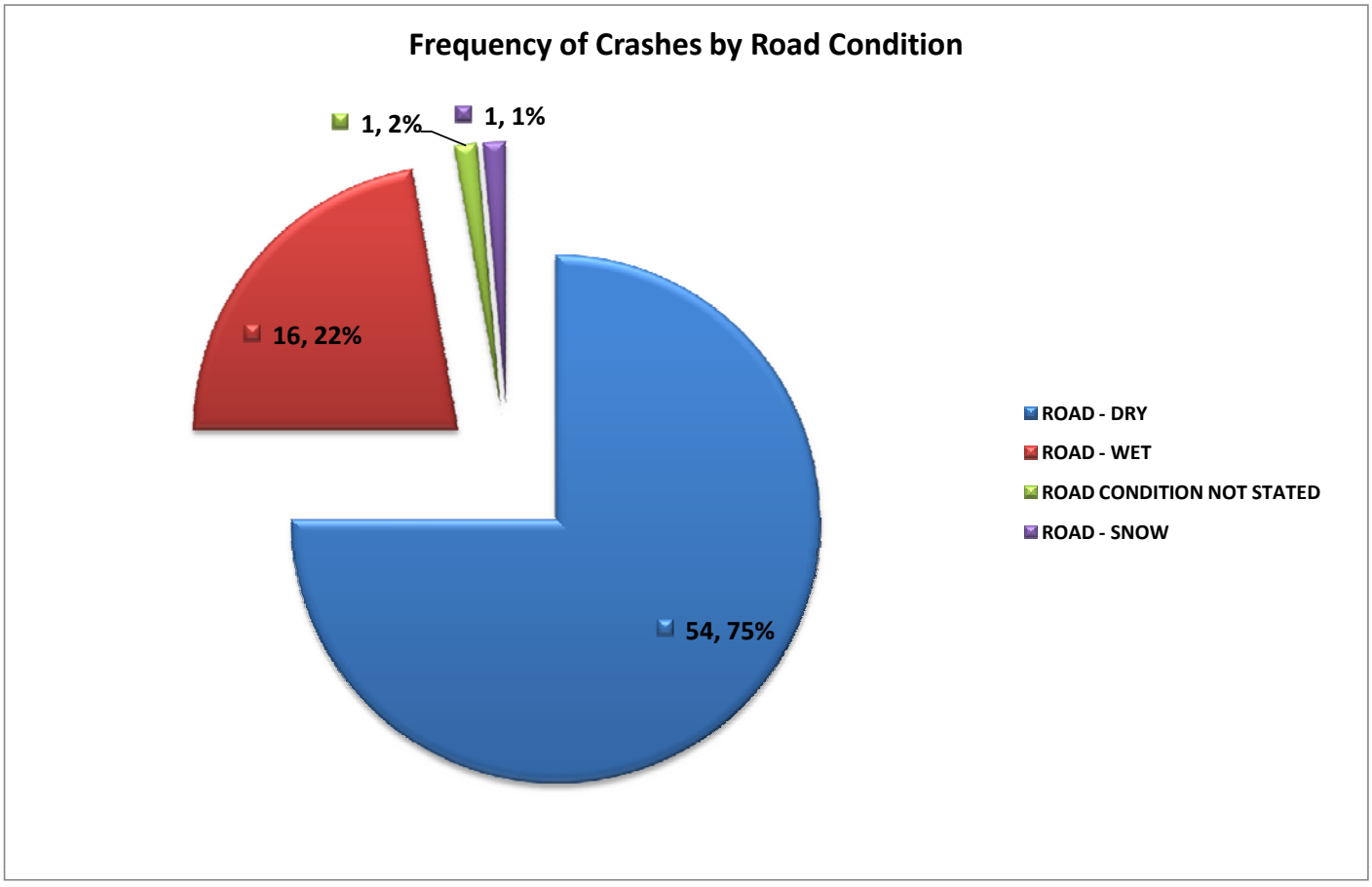
SUM-SR 18R - (SLM 1.55) From 01/01/2006 to 12/31/2008



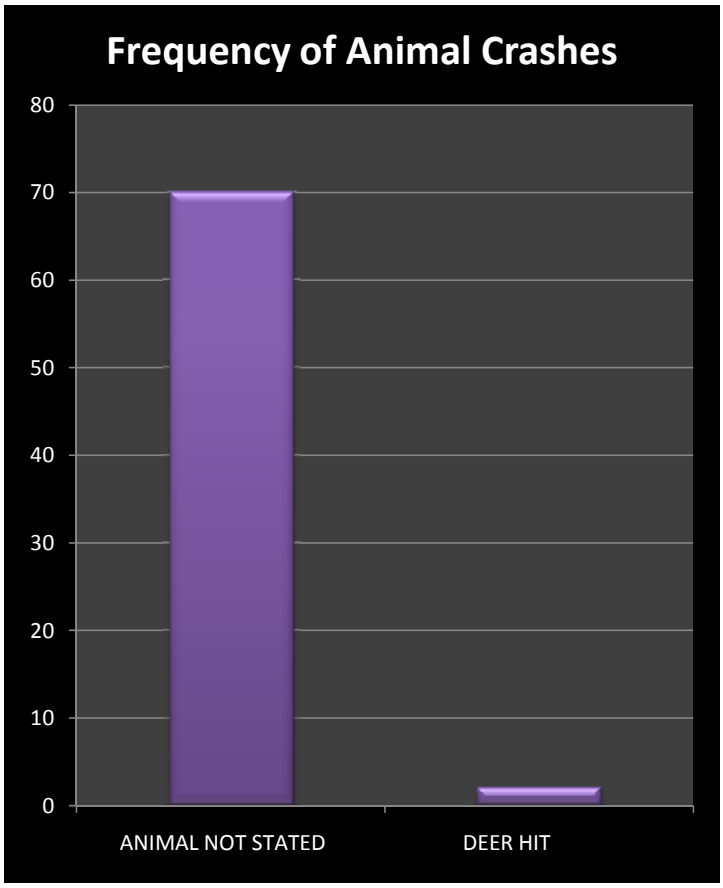


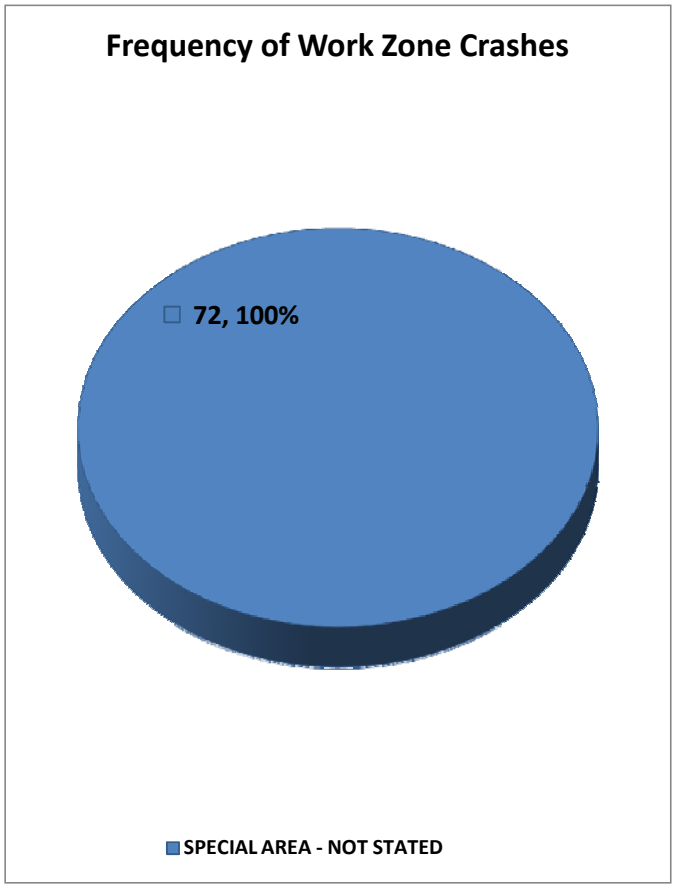
SUM-SR 18R - (SLM 1.55) From 01/01/2006 to 12/31/2008

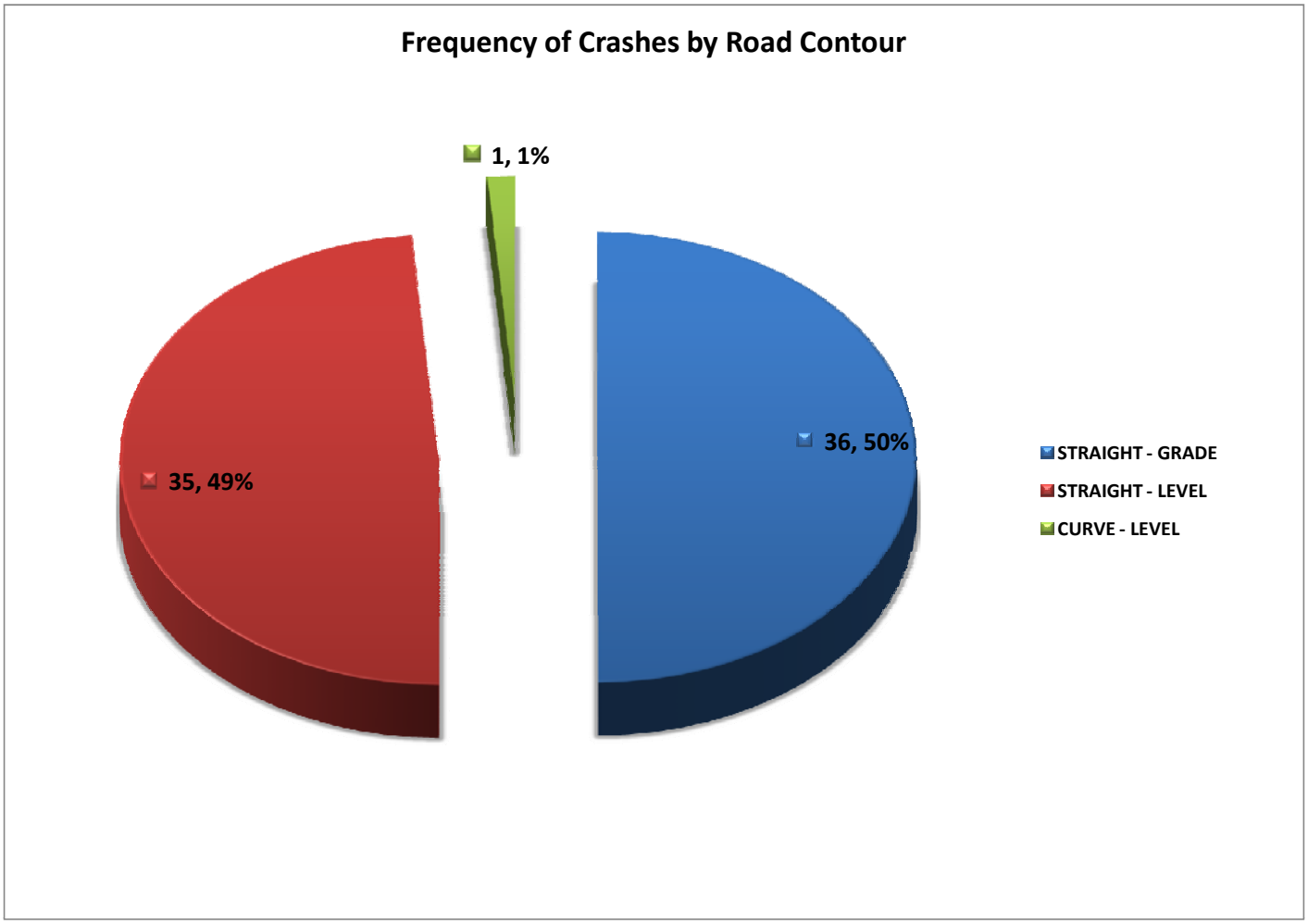


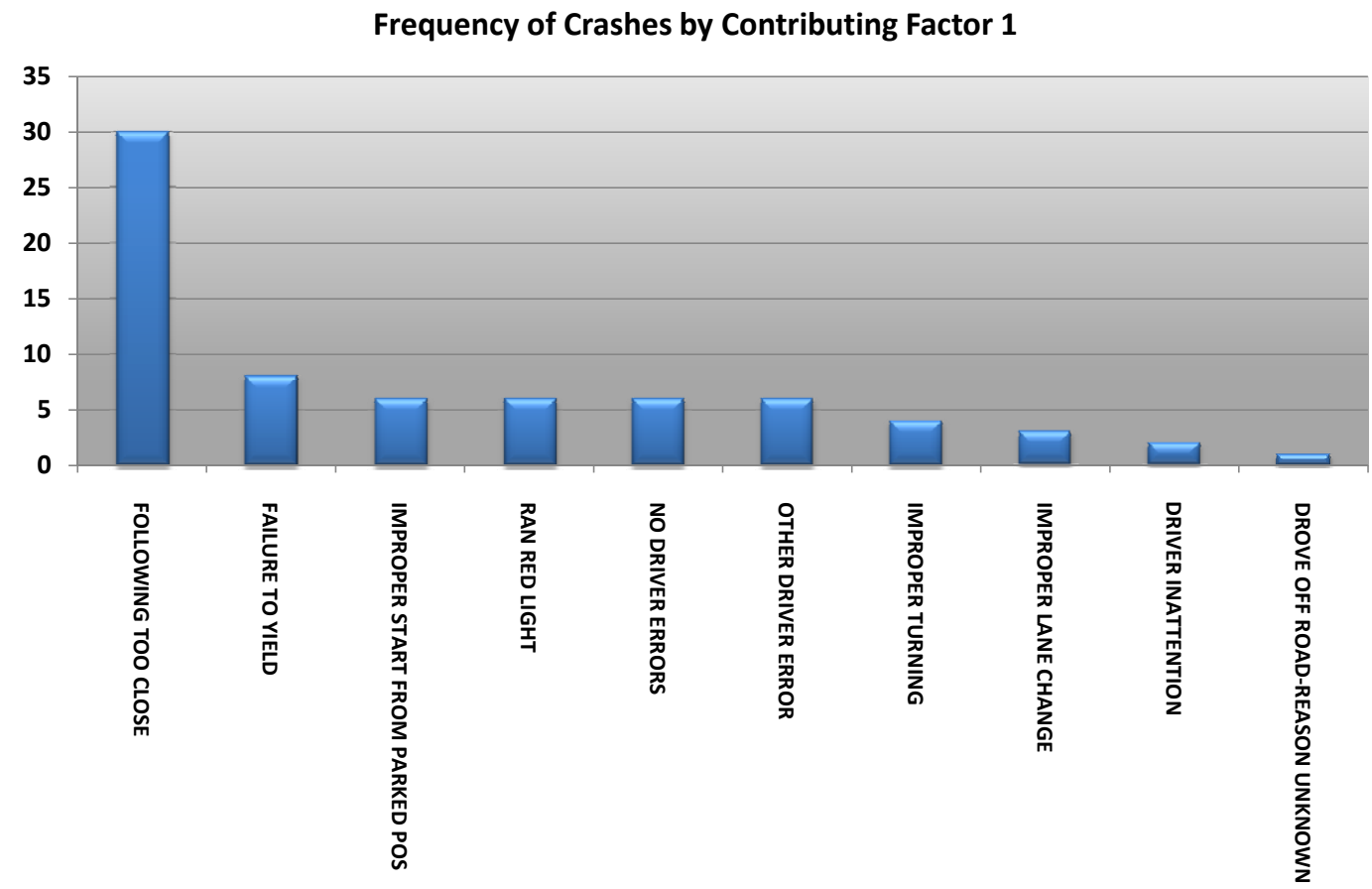


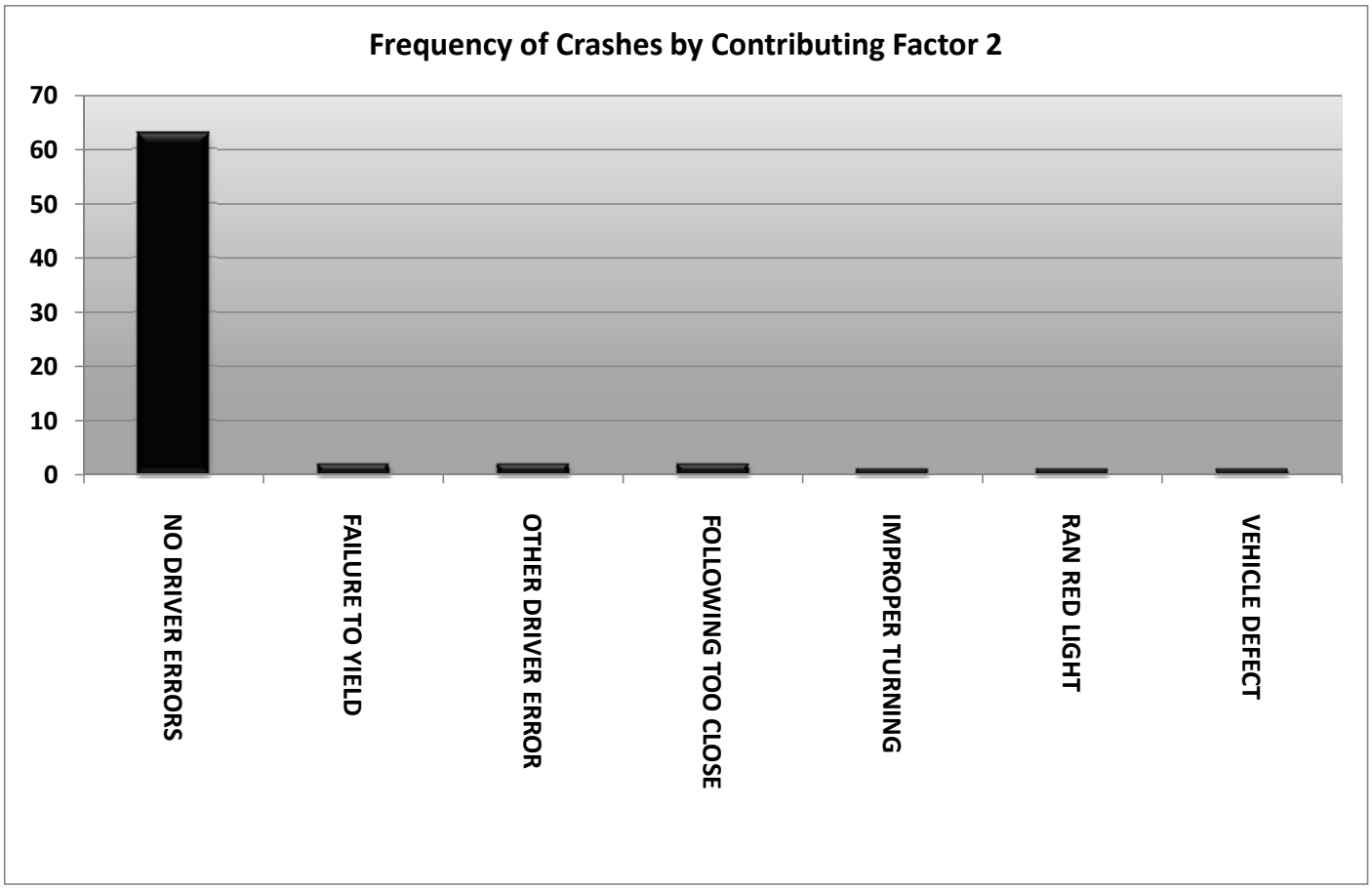
SUM-SR 18R - (SLM 1.55) From 01/01/2006 to 12/31/2008

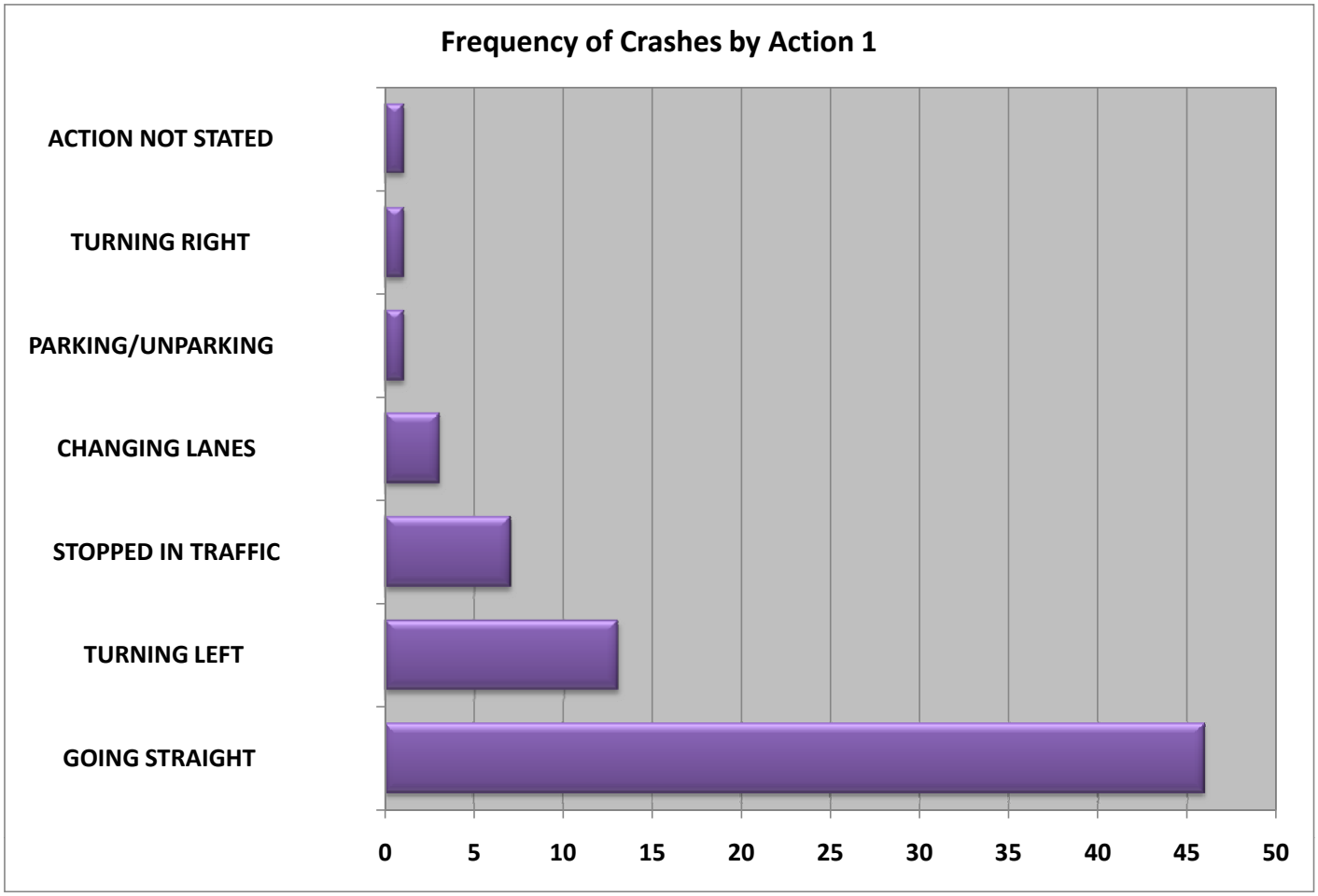


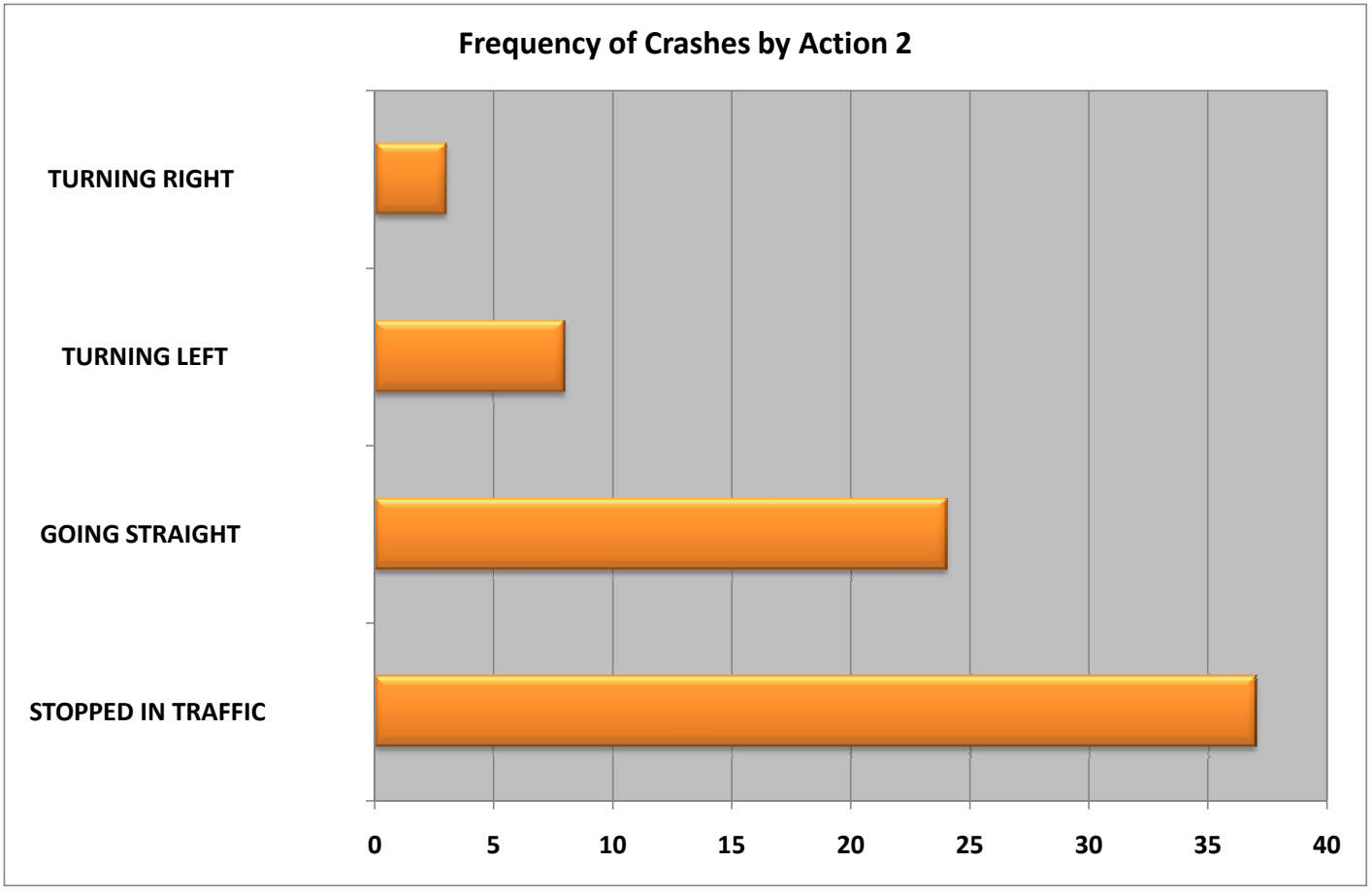


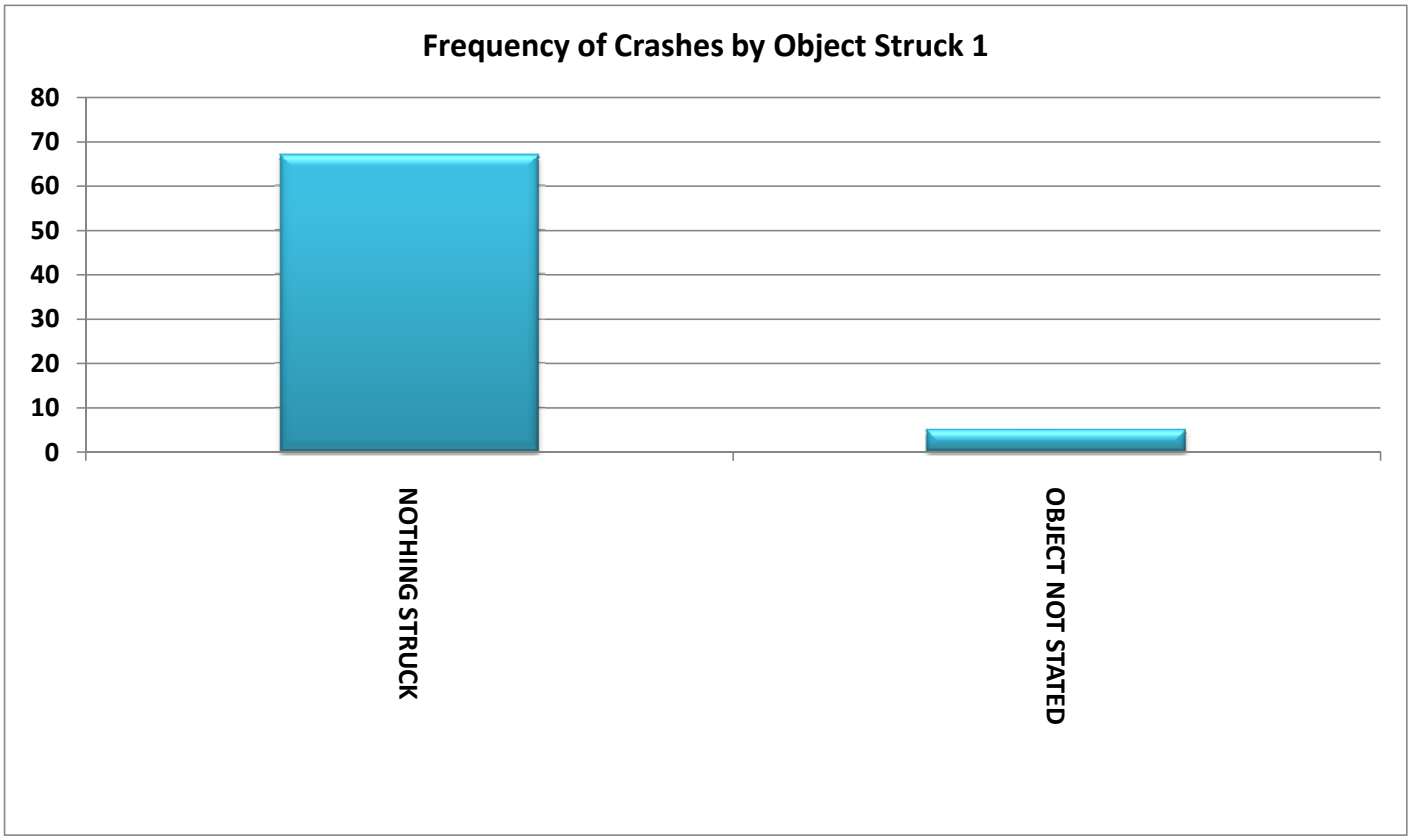


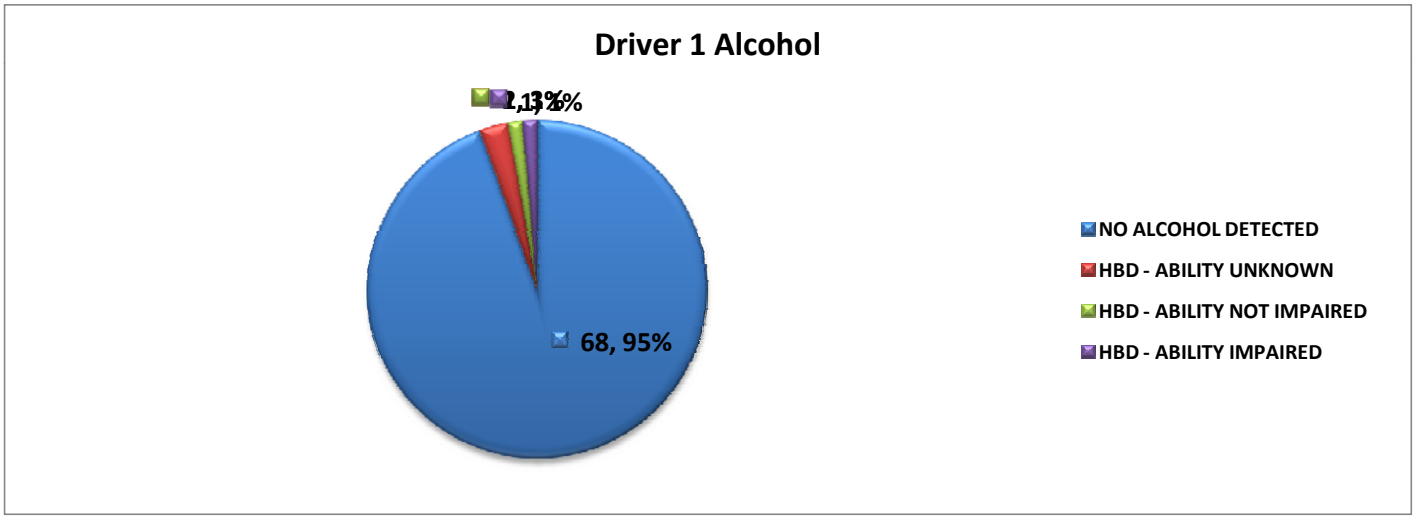

Frequency of Crashes by Contributing Factor 1
35
30
25
20
15
10
5
0
FOLLOWING TOO CLOSE
FAILURE TO YIELD
IMPROPER START FROM PARKED POS
RAN RED LIGHT
NO DRIVER ERRORS
OTHER DRIVER ERROR
IMPROPER TURNING
IMPROPER LANE CHANGE
DRIVER INATTENTION
DROVE OFF ROAD-REASON UNKNOWN

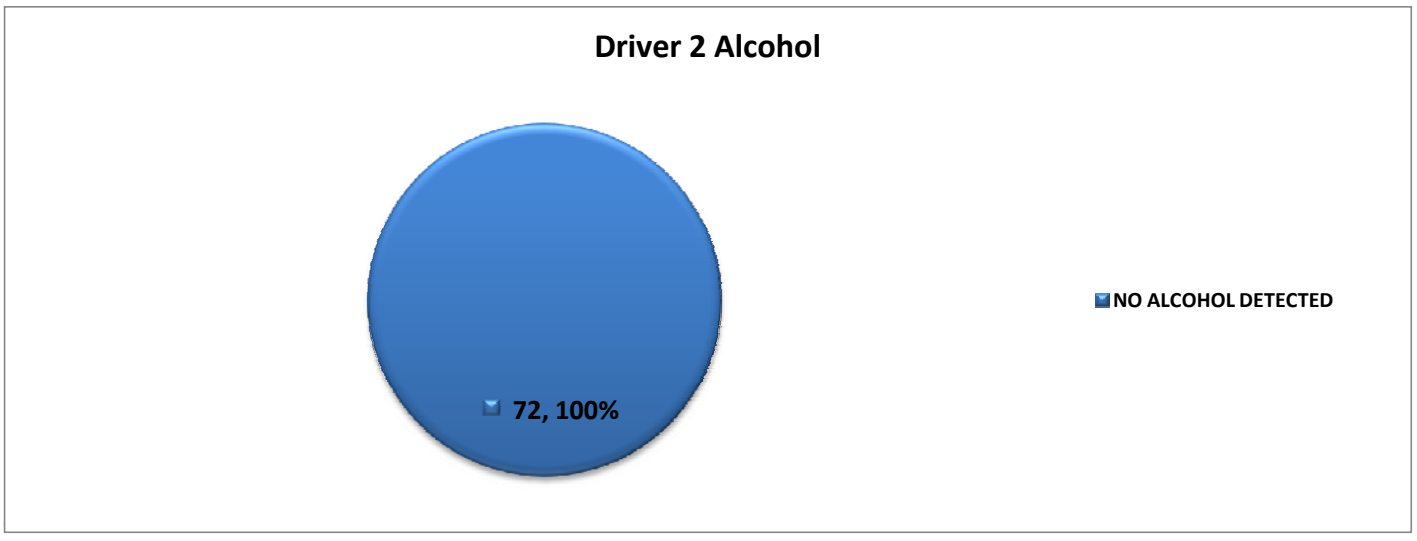

Frequency of Crashes by Contributing Factor 2
70
60
50
40
30
20
10
0
NO DRIVER ERRORS
FAILURE TO YIELD
OTHER DRIVER ERROR
FOLLOWING TOO CLOSE
IMPROPER TURNING
RAN RED LIGHT
VEHICLE DEFECT


Frequency of Crashes by Action 1
ACTION NOT STATED
TURNING RIGHT
PARKING/UNPARKING
CHANGING LANES
STOPPED IN TRAFFIC
TURNING LEFT
GOING STRAIGHT
0
5
10
15
20
25
30
35
40
45
50


Frequency of Crashes by Action 2
TURNING RIGHT
TURNING LEFT
GOING STRAIGHT
STOPPED IN TRAFFIC
0
5
10
15
20
25
30
35
40


Frequency of Crashes by Object Struck 1
80
70
60
50
40
30
20
10
0
NOTHING STRUCK
OBJECT NOT STATED


Driver 1 Alcohol
68, 95%
NO ALCOHOL DETECTED
HBD - ABILITY UNKNOWN
HBD - ABILITY NOT IMPAIRED
HBD - ABILITY IMPAIRED


Driver 2 Alcohol
72, 100%
NO ALCOHOL DETECTED

Appendix B

Certified Traffic

INTER-OFFICE COMMUNICATION

TO: **Joe DeFuria, District 4**

FROM: Becky Salak, Transportation Planner, Office of Statewide Planning and Research

SUBJECT: **SUM-18-Corridor Study, PID 77749**

DATE: May 9, 2011

In reply to a request dated April 12, 2011, attached is a set of plates showing 2015 and 2035 A.M. and P.M. DHV turning movement volumes for the subject project.

Please use the following design designations and truck factors:

	IR-77				**SR-18**	
	north of SR-18	*north of SR-21*	*south of SR-21*	*south of Cleveland-Massillon Rd*	*east of IR-77*	*east of Springside Dr*
2015 ADT:	60890	83870	52640	66140	41640	32940
2035 ADT:	74620	101620	60320	73820	41640	32940
K:	0.11	0.10	0.10	0.10	0.10	0.11
D:	0.65	0.61	0.55	0.54	0.52	0.53
T24:	0.11	0.11	0.10	0.09	0.03	0.03
A.M. TD:	0.06	0.06	0.06	0.05	0.02	0.02
P.M. TD:	0.06	0.06	0.06	0.05	0.02	0.02

	SR-18					**SR-21**
	west of IR-77	*west of Crystal Lake Dr*	*west of Heritage Woods Dr*	*west of N. Hametown Rd*	*west of Medina Line Rd*	*south of IR-77*
2015 ADT:	51010	36780	34900	27320	27230	39830
2035 ADT:	62640	49060	45760	35830	35520	51500
K:	0.09	0.09	0.09	0.09	0.09	0.11
D:	0.52	0.58	0.58	0.53	0.50	0.65
T24:	0.05	0.05	0.06	0.08	0.09	0.10
A.M. TD:	0.03	0.03	0.04	0.05	0.05	0.06
P.M. TD:	0.03	0.03	0.04	0.05	0.05	0.06

IR-77 & SR-18 Ramps

	SB-WB	SB-EB	NB-EB	NB-WB	EB-SB	EB-NB	WB-NB	WB-SB
A.M. TD:	0.07	0.08	0.03	0.12	0.07	0.04	0.03	0.04
P.M. TD:	0.02	0.04	0.02	0.07	0.07	0.03	0.02	0.04

IR-77 & SR-21 Ramps

	77 SB to 21 SB	77 NB to 21 SB	21 NB to 77 SB	21 NB to 77 NB
A.M. TD:	0.03	0.02	0.03	0.06
P.M. TD:	0.03	0.02	0.02	0.06

IR-77 & Cleveland-Massillon Rd Ramps

	77 NB to Clev-Mass Rd	Clev-Mass Rd to 77 SB
A.M. TD:	0.04	0.03
P.M. TD:	0.03	0.02

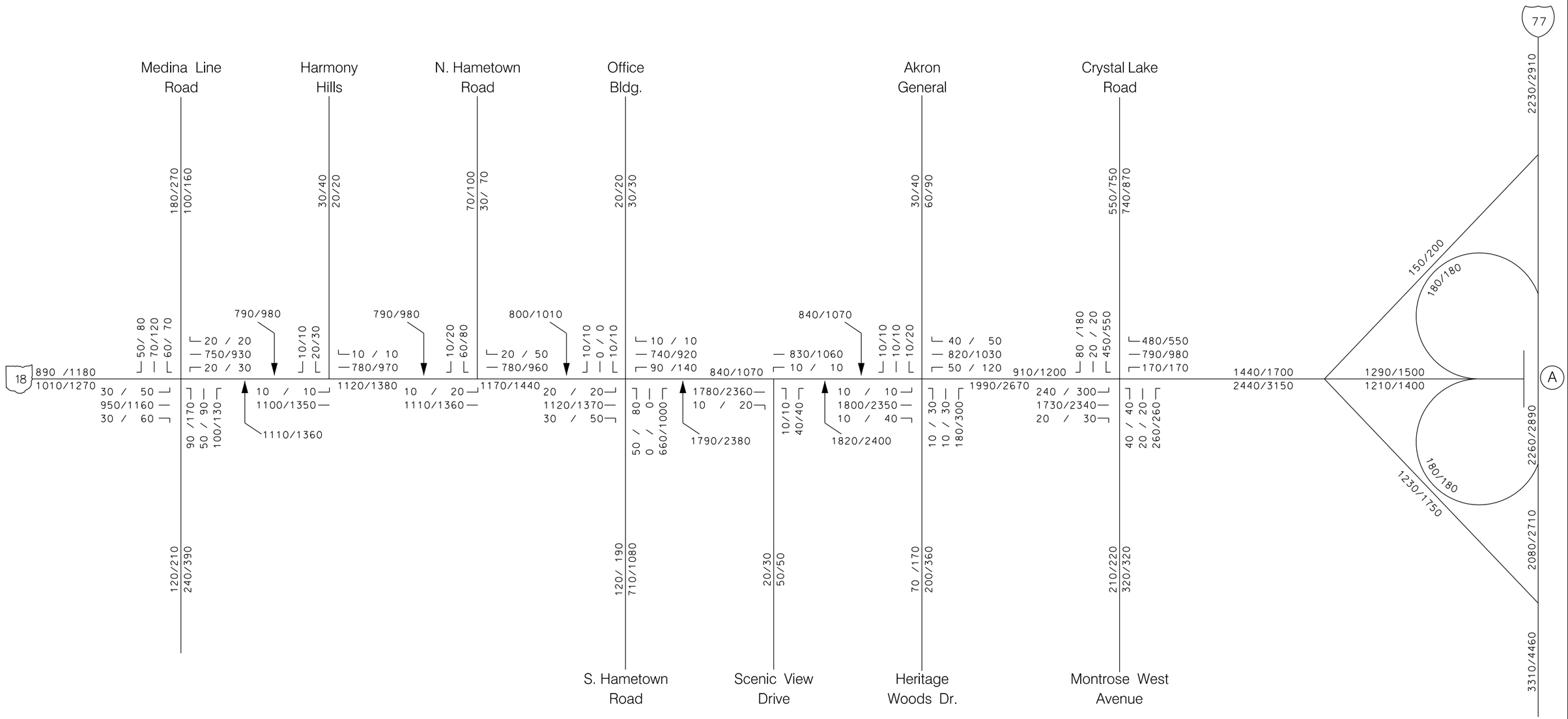
	All other locations
A.M. TD:	0.02
P.M. TD:	0.02

If you have any questions, please contact me at (614) 644-8195.

c: M. Byram, OSPR – G. Giaimo, OSPR – File

SUM–18–Corridor Study
PID 77749
PLATE 1 OF 4

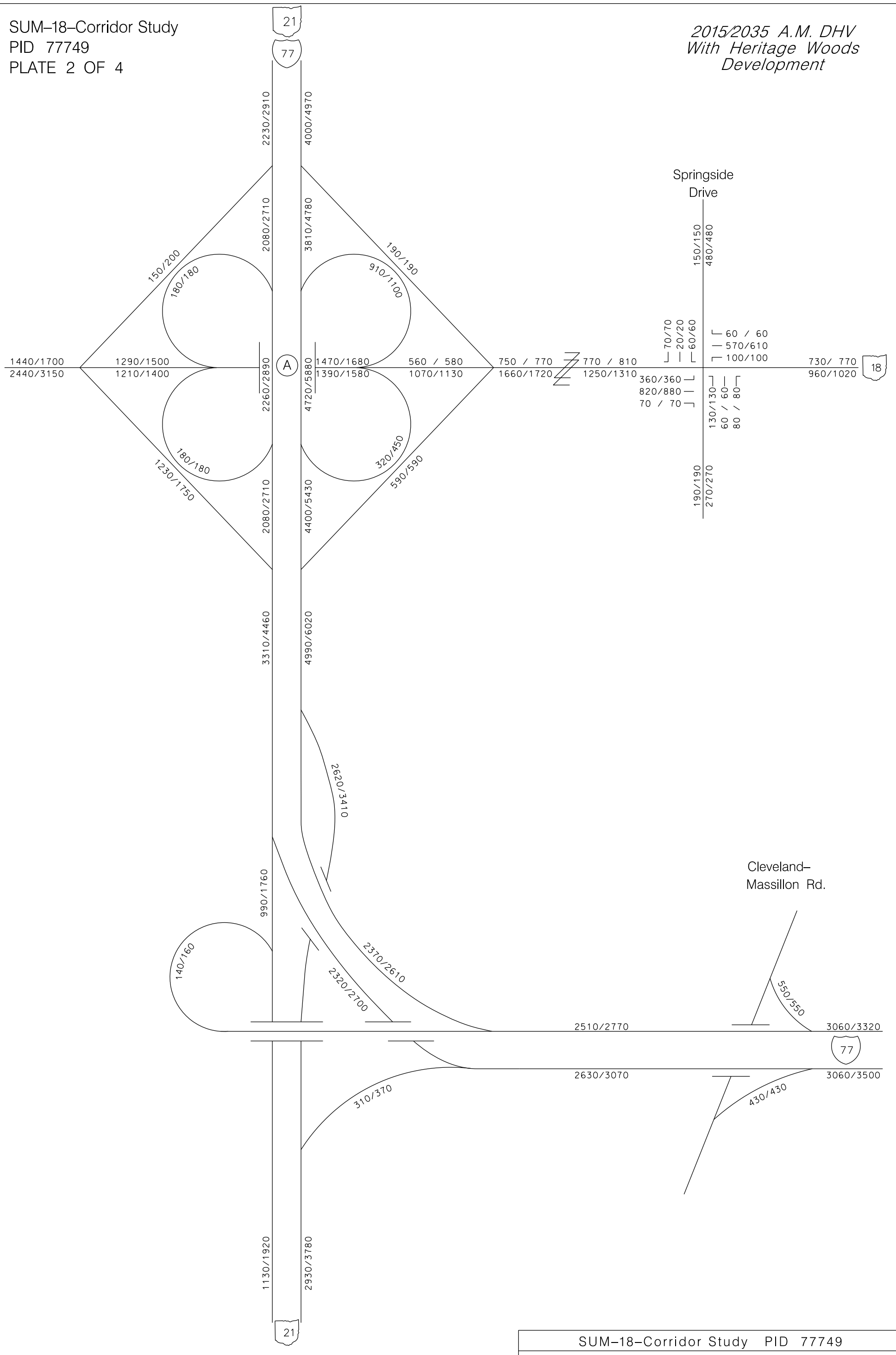
2015/2035 A.M. DHV
With Heritage Woods
Development



SUM–18–Corridor Study PID 77749
2015/2035 A.M. DHV
OHIO DEPARTMENT OF TRANSPORTATION
OFFICE OF STATEWIDE PLANNING & RESEARCH
MAY 9, 2011 | NOT TO SCALE

SUM–18–Corridor Study
PID 77749
PLATE 2 OF 4

2015/2035 A.M. DHV
With Heritage Woods
Development



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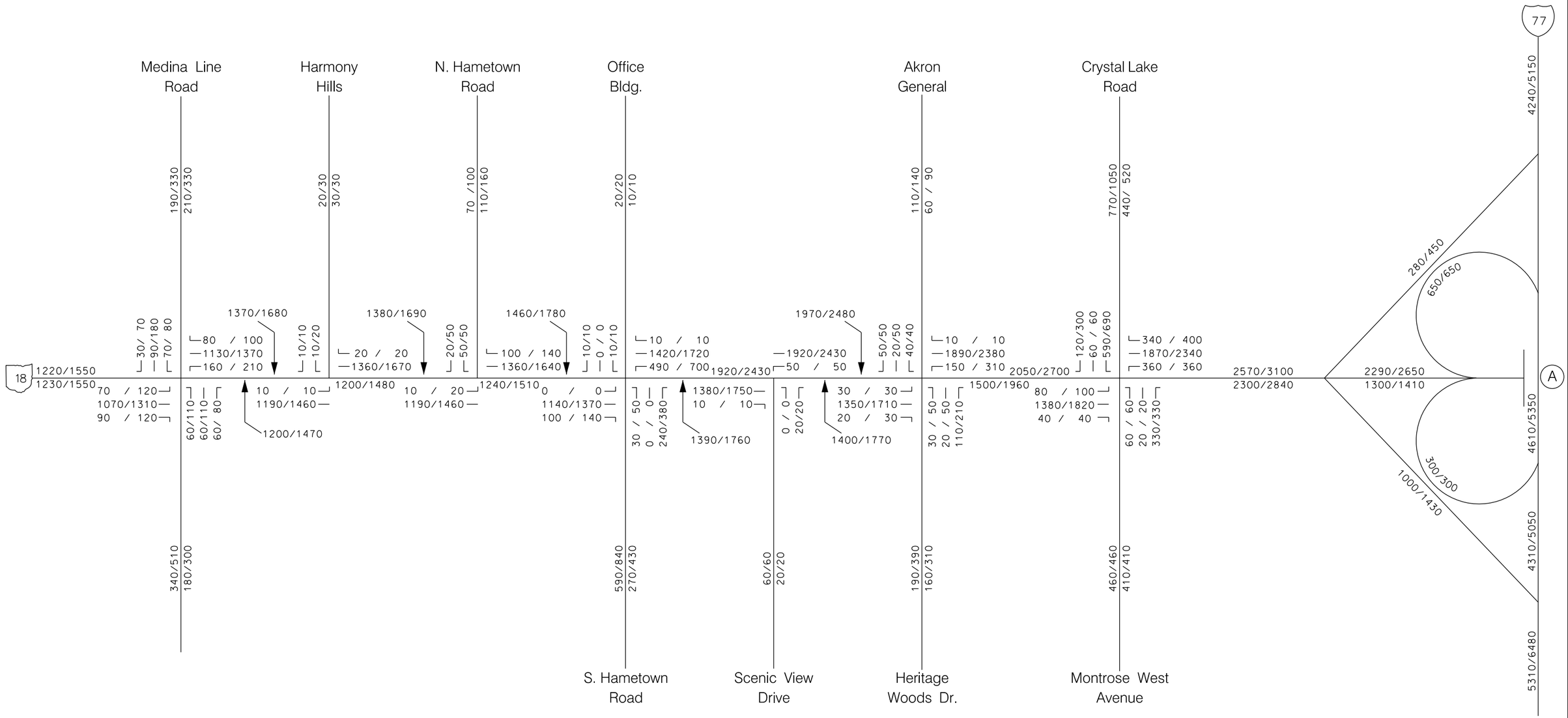
2015/2035 A.M. DHV	
OHIO DEPARTMENT OF TRANSPORTATION	
OFFICE OF STATEWIDE PLANNING & RESEARCH	
MAY 9, 2011	NOT TO SCALE

SUM–18–Corridor Study
PID 77749
PLATE 3 OF 4

2015/2035 P.M. DHV
With Heritage Woods
Development



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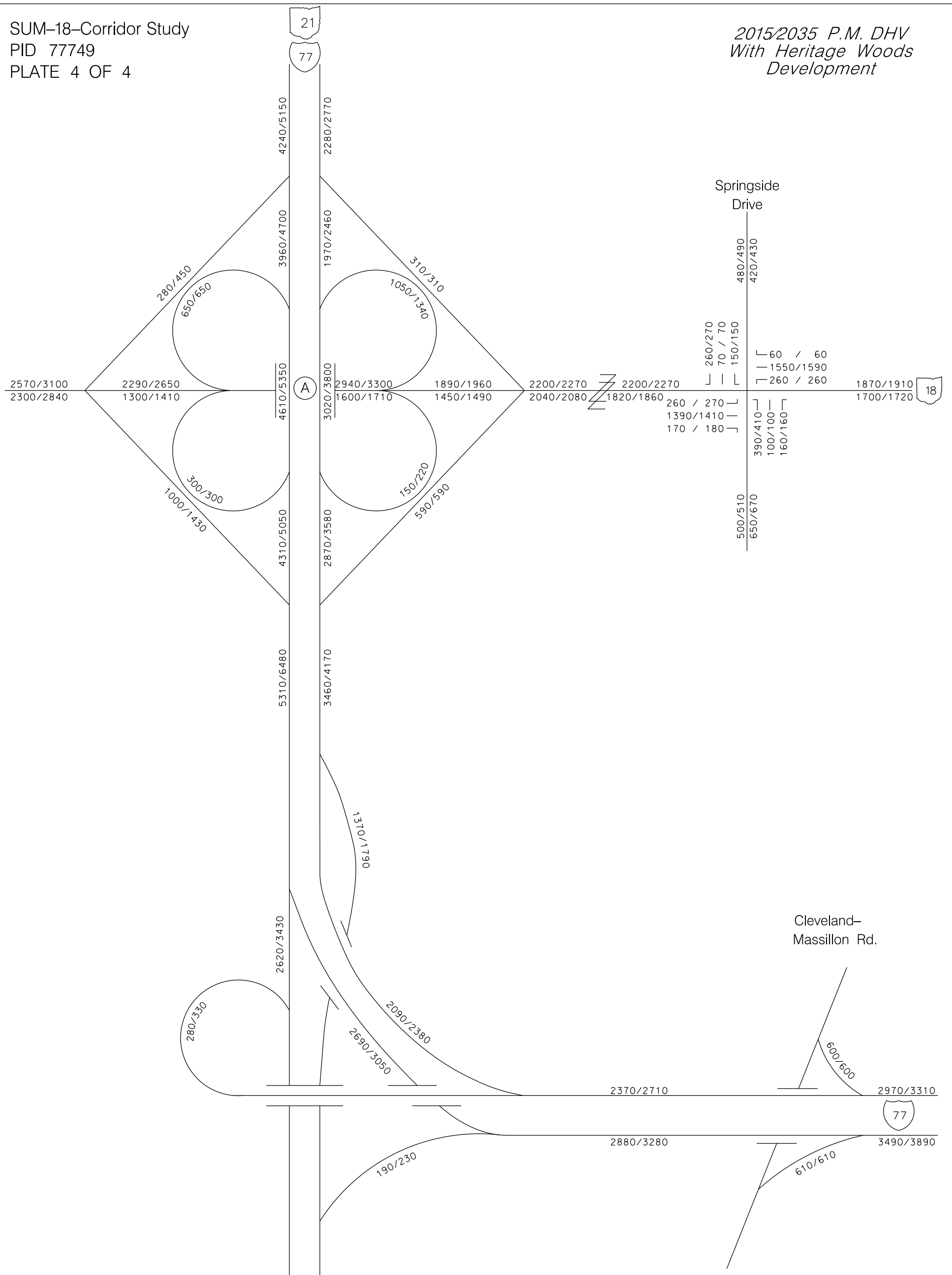
MAY 9, 2011	NOT TO SCALE

SUM–18–Corridor Study
PID 77749
PLATE 4 OF 4

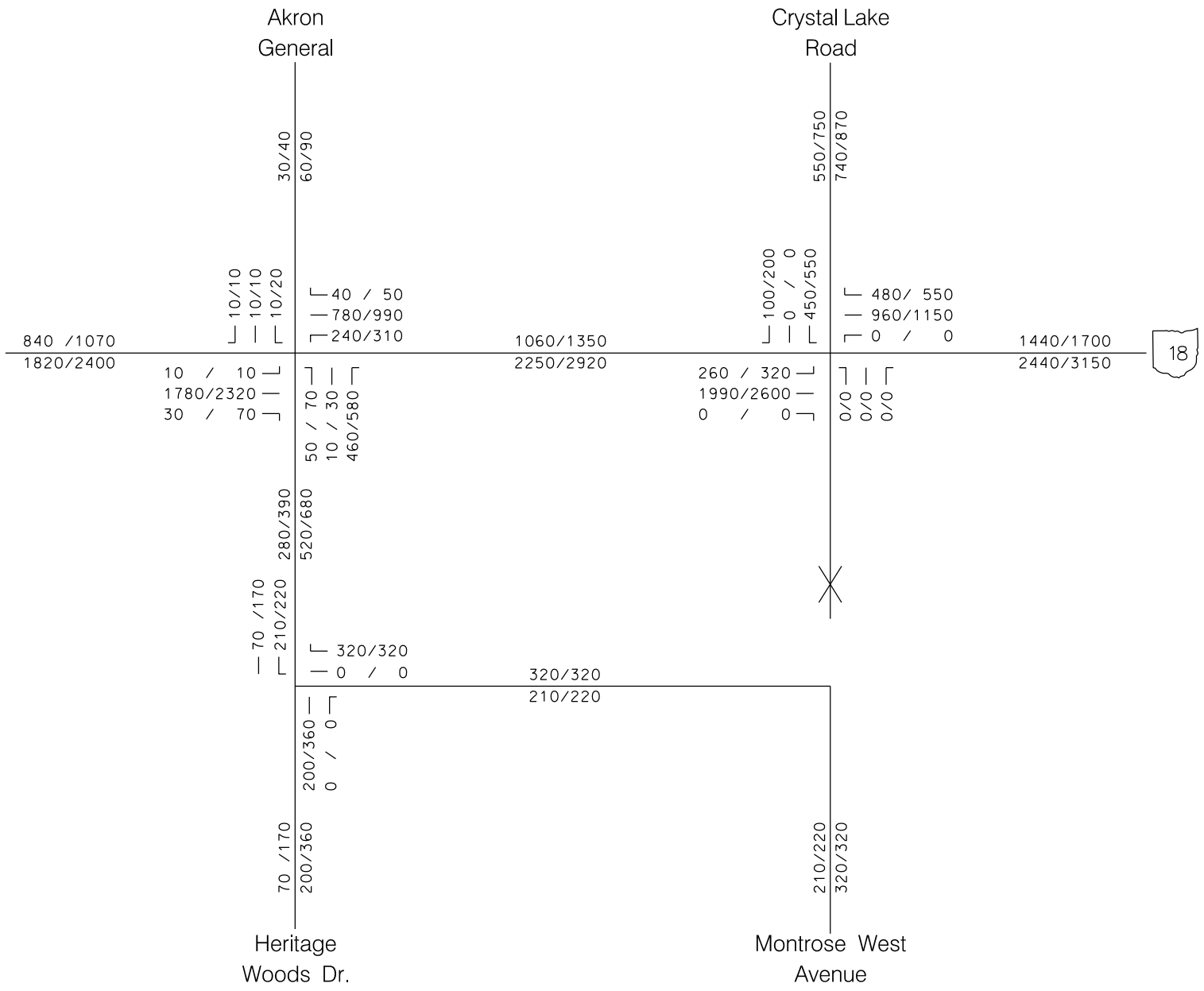
2015/2035 P.M. DHV
With Heritage Woods
Development



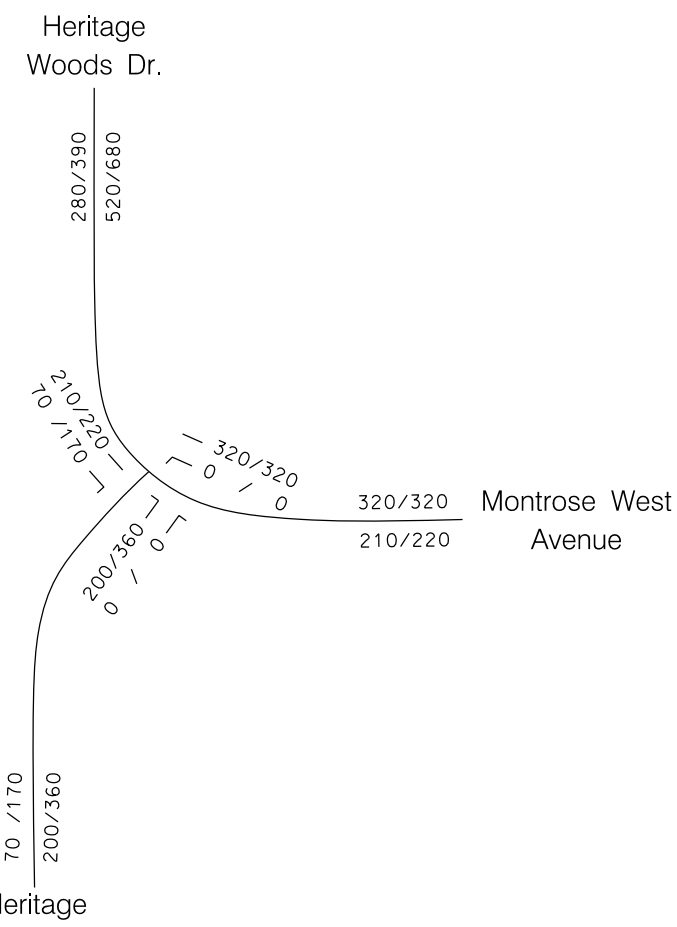
SUM–18–Corridor Study PID 77749	
2015/2035 P.M. DHV	
OHIO DEPARTMENT OF TRANSPORTATION	
OFFICE OF STATEWIDE PLANNING & RESEARCH	
MAY 9, 2011	NOT TO SCALE

RELOCATE MONTROSE WEST
TO HERITAGE WOODS
PLATE 1 OF 2

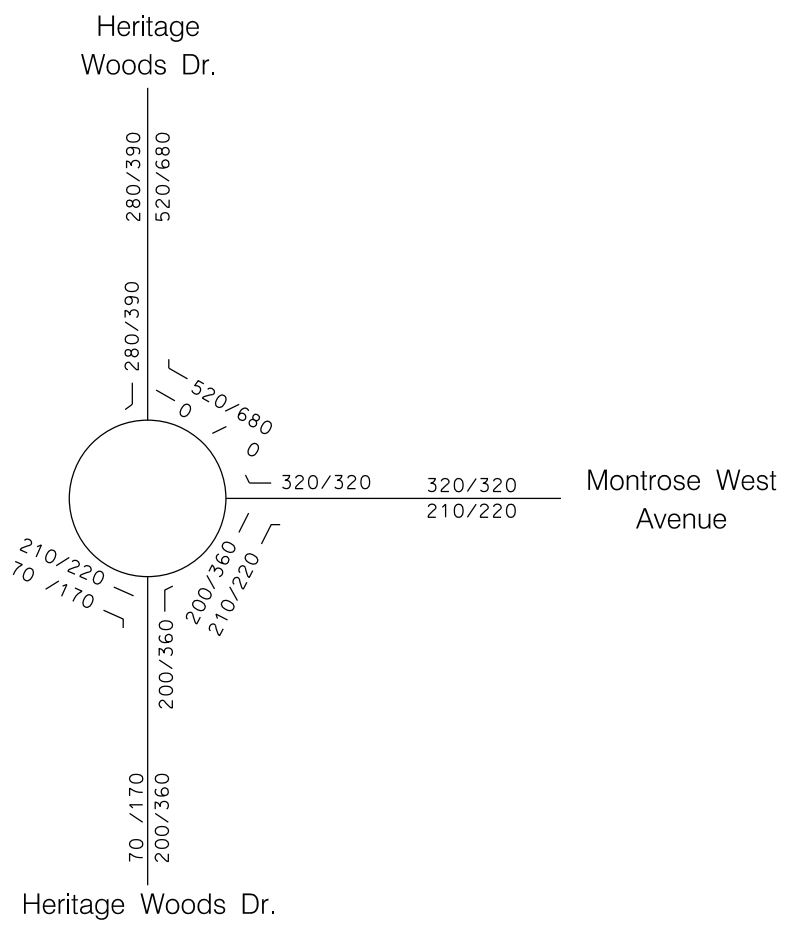
2015/2035 A.M. DHV
With Heritage Woods
Development and
Relocation of Montrose West



Option 1 Intersection Configuration



Option 2 Intersection Configuration

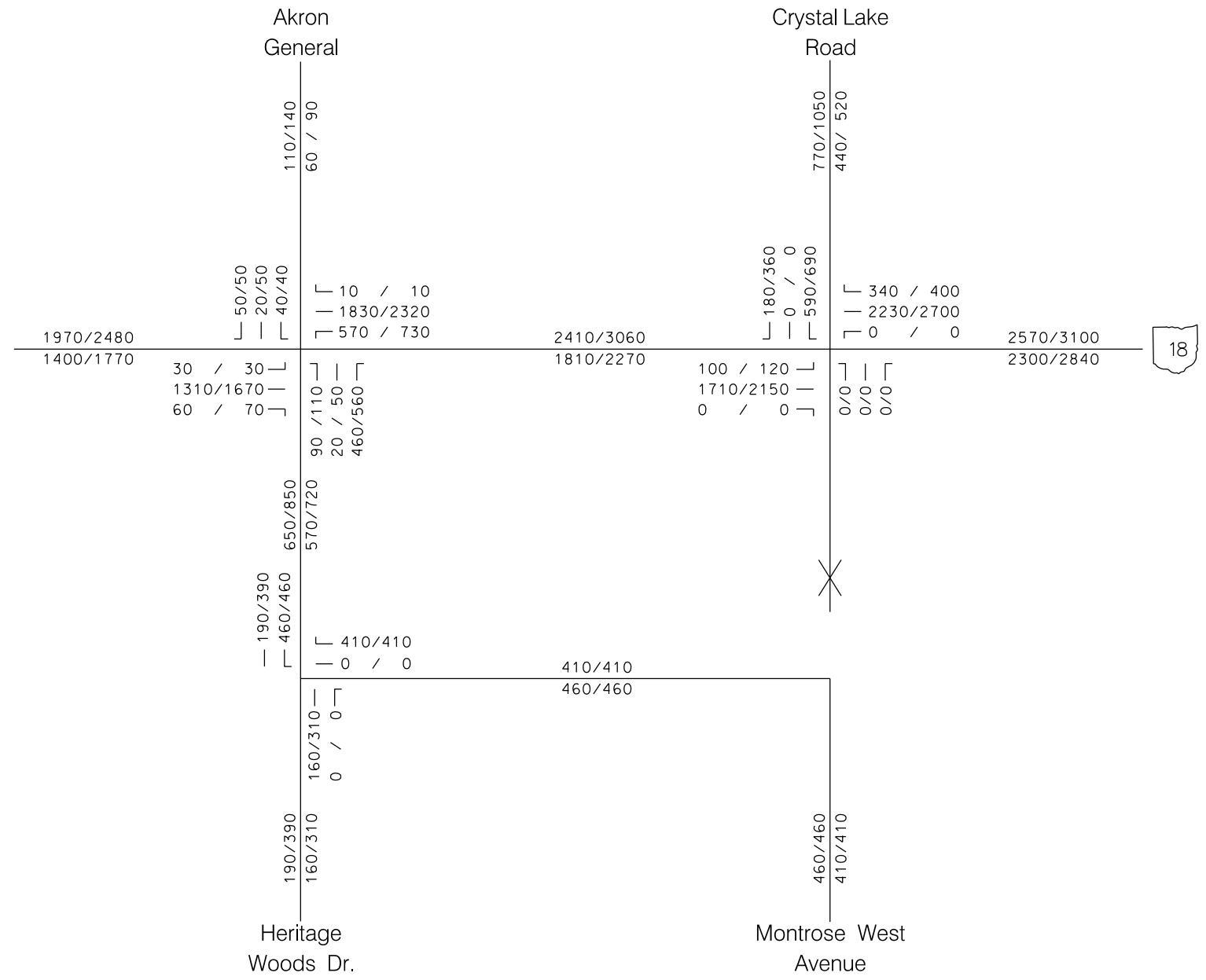


Option 3 Intersection Configuration

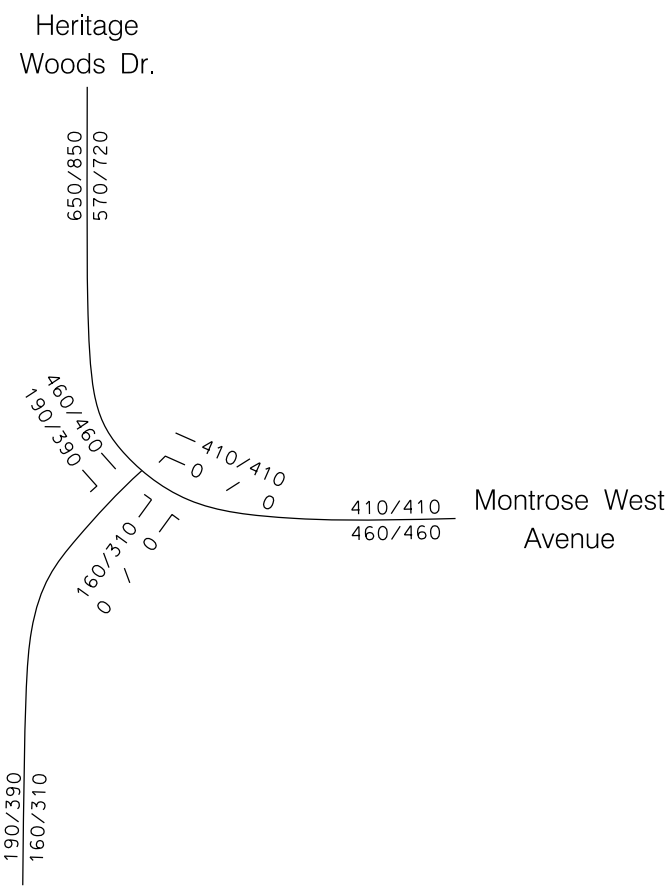
RELOCATE MONTROSE WEST	
2015/2035 A.M. DHV	
OHIO DEPARTMENT OF TRANSPORTATION	
OFFICE OF STATEWIDE PLANNING & RESEARCH	
MAY 9, 2011	NOT TO SCALE

RELOCATE MONTROSE WEST
TO HERITAGE WOODS
PLATE 2 OF 2

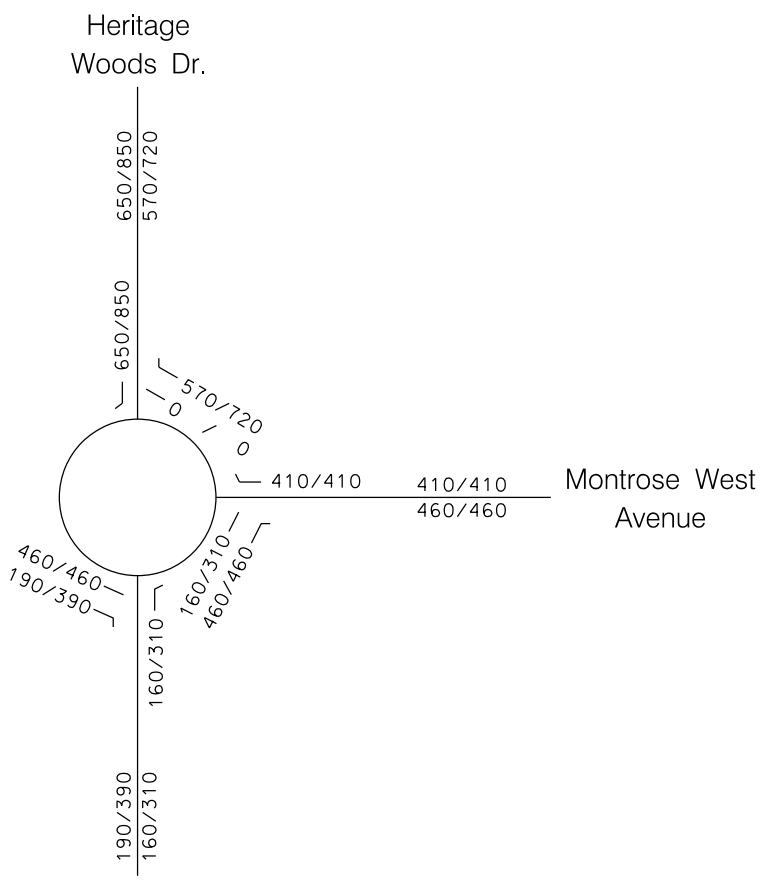
2015/2035 P.M. DHV
With Heritage Woods
Development and
Relocation of Montrose West



Option 1 Intersection Configuration



Option 2 Intersection Configuration



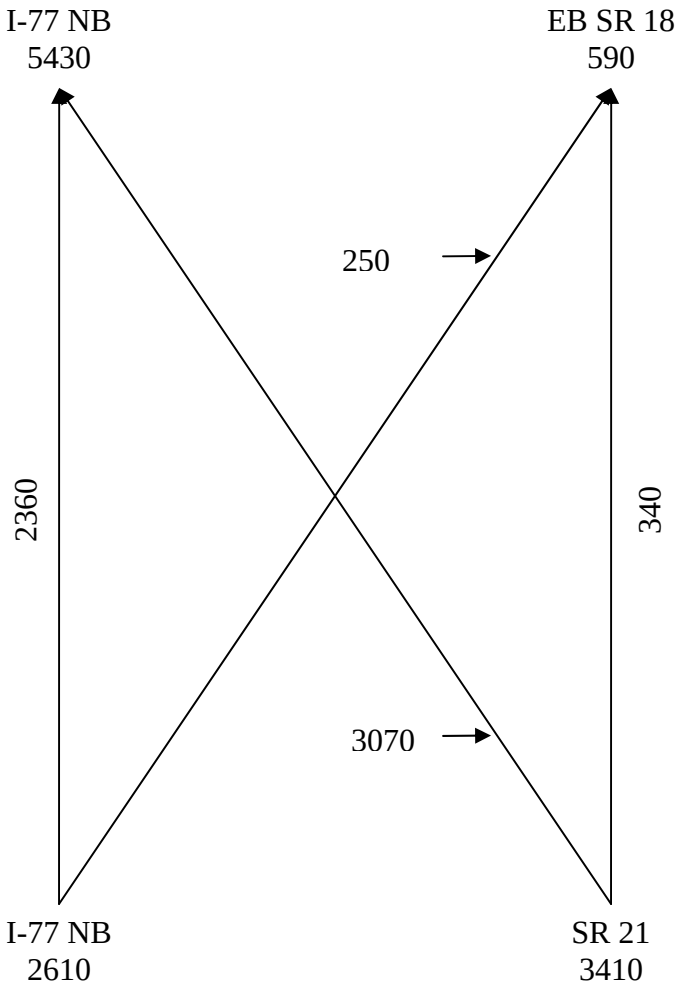
Option 3 Intersection Configuration

RELOCATE MONTROSE WEST	
2015/2035 P.M. DHV	
OHIO DEPARTMENT OF TRANSPORTATION	
OFFICE OF STATEWIDE PLANNING & RESEARCH	
MAY 9, 2011	NOT TO SCALE

2035 AM Weave Volumes

Weave 1 – I-77 Northbound from SR 21 to SR 18

% of CUBE volume on off-ramp to EB SR 18 that comes from I-77 = 1218/2827 = 43%
0.43* 590 = **250 vehicles**

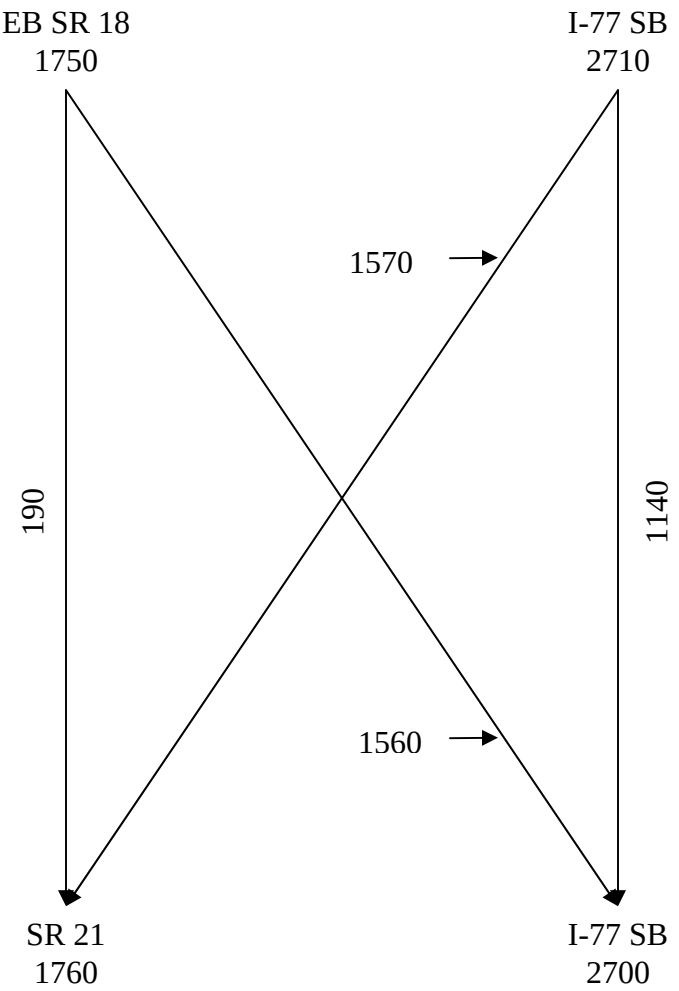


2035 Weaving Volumes
AM Peak Hour

Weave 2 – I-77 Southbound from SR 18 to SR 21

% of CUBE volumes on off-ramp to SR 21 that come from EB SR 18 on-ramp = 350/3247 = 11%

0.11 * 1760 = **190 vehicles**

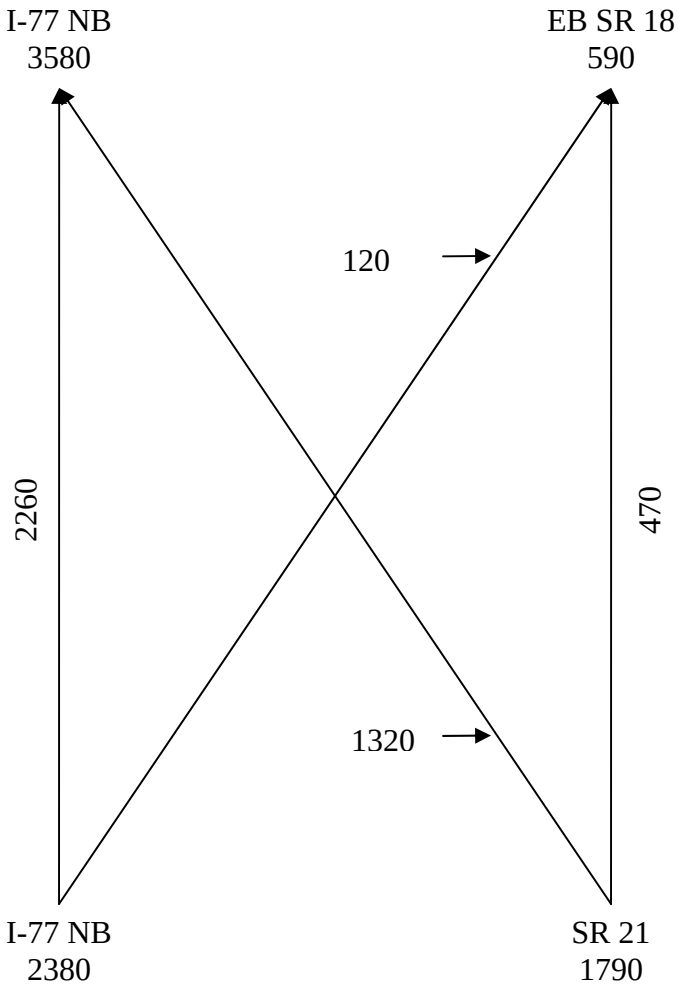


2035 Weaving Volumes
AM Peak Hour

2035 PM Weave Volumes

Weave 1 – I-77 Northbound from SR 21 to SR 18

% of CUBE volume on off-ramp to EB SR 18 that comes from I-77 = 400/1878 = 21%
0.21 * 590 = **120 vehicles**

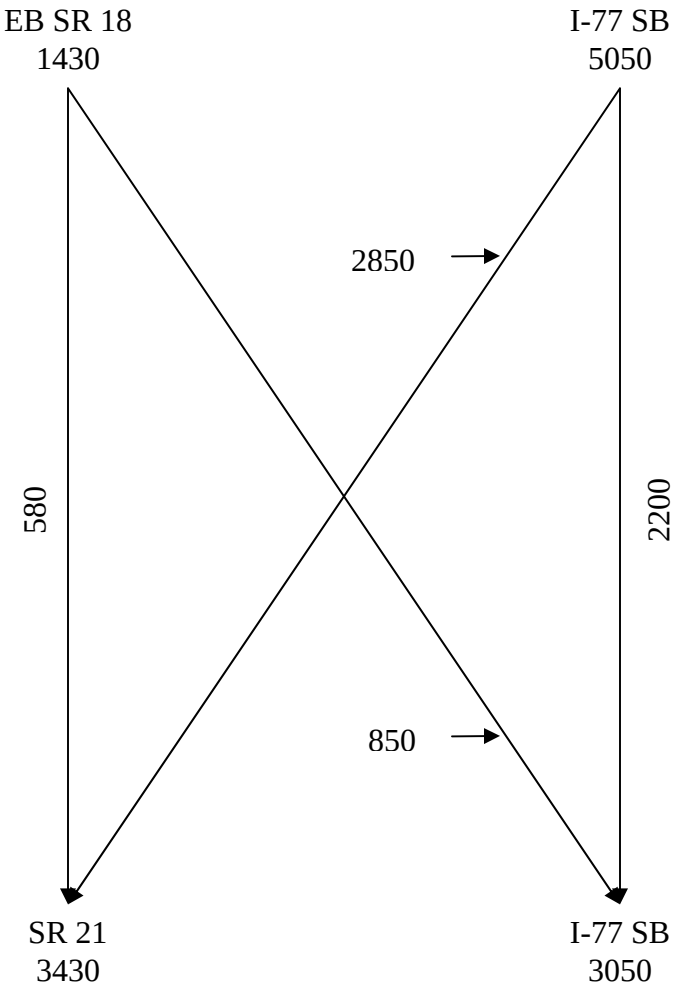


2035 Weaving Volumes
PM Peak Hour

Weave 2 – I-77 Southbound from SR 18 to SR 21

% of CUBE volumes on off-ramp to SR 21 that comes from EB SR 18 on-ramp = 1038/6099 = 17%

0.17 * 3430 = **580 vehicles**



Appendix C

Freeway LOS Analysis

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	North of Ramp to SR 18 WB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18	Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	2910	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	808	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	1110	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1110	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	70.0	mi/h
Number of lanes, N	3	
Density, D	15.9	pc/mi/ln
Level of service, LOS	B	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	North of Ramp to SR 18 WB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	5150	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1431	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	1965	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1965	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	65.5	mi/h
Number of lanes, N	3	
Density, D	30.0	pc/mi/ln
Level of service, LOS	D	

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

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date performed:	9/6/2011
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	I-77 SB
Junction:	Exit to SR 18 WB
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2910	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	200	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?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2910	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	808	56		v
Trucks and buses	6	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.971	0.966		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	3330	230		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.666 Using Equation 5

$v = v_{FD} + (v - v_{FD}) P_{FD}$ = 2295 pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3330	7200	No
$v_{FO} = v - v_{FR}$	3100	7200	No
v_R	230	2000	No
$v_{3 \text{ or } av34}$	1035 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\ v_{12}/2$		No	
If yes, $v_{12A} = 2295$		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2295	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D = 19.5$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.449$	
Space mean speed in ramp influence area,	$S_R = 57.4$	mph
Space mean speed in outer lanes,	$S_0 = 76.7$	mph
Space mean speed for all vehicles,	$S = 62.3$	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date performed:	9/6/2011
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	I-77 SB
Junction:	Exit to SR 18 WB
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	70.0	mph
Volume on freeway	5150	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	450	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?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	5150	450		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1431	125		v
Trucks and buses	6	2		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.971	0.990		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	5894	505		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.589 Using Equation 5

$v = v_{12} + (v - v_{12}) P_{FD}$ = 3681 pc/h

12 R F R FD

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5894	7200	No
$v_{FO} = v - v_{FR}$	5389	7200	No
v_R	505	2000	No
$v_{3 \text{ or } av34}$	2213 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\ v_{12}/2$		No	
If yes, $v_{12A} = 3681$		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3681	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D = 31.4$ pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	$D_S = 0.473$	
Space mean speed in ramp influence area,	$S_R = 56.7$	mph
Space mean speed in outer lanes,	$S_0 = 72.1$	mph
Space mean speed for all vehicles,	$S = 61.7$	mph

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	South of Exit to SR 18 WB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	2710	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	753	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	1034	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1034	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	70.0	mi/h
Number of lanes, N	3	
Density, D	14.8	pc/mi/ln
Level of service, LOS	B	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	South of Exit to SR 18 WB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	4700	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1306	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	1793	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1793	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	67.9	mi/h
Number of lanes, N	3	
Density, D	26.4	pc/mi/ln
Level of service, LOS	D	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	WB SR 18 On-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	360	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	100	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.980	
Driver population factor, fp	1.00	
Flow rate, vp	204	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	204	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	3.7	pc/mi/ln
Level of service, LOS	A	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	WB SR 18 On-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	1300	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	361	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.980	
Driver population factor, fp	1.00	
Flow rate, vp	737	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	737	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	13.4	pc/mi/ln
Level of service, LOS	B	

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

HCS+: Freeway Weaving Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Dir of Travel:	I-77 SB
Weaving Location:	WB SR 18 On to EB SR 18 Off
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	4	
Weaving segment length, L	840	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	
Volume ratio, VR	0.12	
Weaving ratio, R	0.50	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V o1	V o2	V w1	V w2	
Volume, V	2530	0	180	180	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	703	0	50	50	v
Trucks and buses	6	0	4	8	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.971	1.000	0.980	0.962	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2895	0	204	208	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.0035
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.60	0.22
Weaving and non-weaving speeds, Si	52.48	64.08
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		0.77
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	62.36	mph
Weaving segment density, D	13.26	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	8209	pc/h
Capacity as a 15-minute flow rate, c	7970	pc/h

Capacity as a full-hour volume, ch 7173 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	412	2800	a
Average flow rate (pcphpl)	826	2400	b
Volume ratio, VR	0.12	0.35	c
Weaving ratio, R	0.50	N/A	d
Weaving length (ft)	840	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Freeway Weaving Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Dir of Travel:	I-77 SB
Weaving Location:	WB SR 18 On to EB SR 18 Off
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	4	
Weaving segment length, L	840	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	
Volume ratio, VR	0.18	
Weaving ratio, R	0.32	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V o1	V o2	V w1	V w2	
Volume, V	4400	0	650	300	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	1222	0	181	83	v
Trucks and buses	6	0	4	4	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.971	1.000	0.980	0.980	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	5035	0	736	340	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.0035
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	1.20	0.59
Weaving and non-weaving speeds, Si	42.24	52.70
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		1.03
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	50.50	mph
Weaving segment density, D	30.25	pc/mi/ln
Level of service, LOS	D	
Capacity of base condition, cb	7843	pc/h
Capacity as a 15-minute flow rate, c	7615	pc/h

Capacity as a full-hour volume, ch 6853 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	1076	2800	a
Average flow rate (pcphpl)	1527	2400	b
Volume ratio, VR	0.18	0.35	c
Weaving ratio, R	0.32	N/A	d
Weaving length (ft)	840	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	EB SR 18 Off-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	360	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	100	v
Trucks and buses	8	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.962	
Driver population factor, fp	1.00	
Flow rate, vp	208	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	208	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	3.8	pc/mi/ln
Level of service, LOS	A	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	EB SR 18 Off-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	600	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	167	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.980	
Driver population factor, fp	1.00	
Flow rate, vp	340	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	340	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	6.2	pc/mi/ln
Level of service, LOS	A	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	South of Exit to SR 18 EB
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	2710	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	753	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	1034	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1034	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	70.0	mi/h
Number of lanes, N	3	
Density, D	14.8	pc/mi/ln
Level of service, LOS	B	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	South of Exit to SR 18 EB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	5050	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1403	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	1926	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1926	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	66.2	mi/h
Number of lanes, N	3	
Density, D	29.1	pc/mi/ln
Level of service, LOS	D	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	EB SR 18 On-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	3500	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	972	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	2012	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2012	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	54.1	mi/h
Number of lanes, N	2	
Density, D	37.2	pc/mi/ln
Level of service, LOS	E	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 SB
From/To:	EB SR 18 On-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	2860	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	794	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	1644	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1644	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	29.9	pc/mi/ln
Level of service, LOS	D	

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

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	2/21/2012
Analysis Time Period:	AM Peak Hour
Freeway/Dir of Travel:	I-77 SB
Weaving Location:	EB SR 18 On to SR 21 Off
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	4	
Weaving segment length, L	2300	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	B	
Volume ratio, VR	0.70	
Weaving ratio, R	0.49	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V_{o1}	V_{o2}	V_{w1}	V_{w2}	
Volume, V	1140	190	1570	1560	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	317	53	436	433	v
Trucks and buses	6	3	6	3	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.971	0.985	0.971	0.985	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1304	214	1796	1759	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.20	6.00
c (Exhibit 24-6)	0.70	1.00
d (Exhibit 24-6)	0.50	0.50
Weaving intensity factor, Wi	0.80	1.28
Weaving and non-weaving speeds, Si	48.37	41.31
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	3.23
Maximum number of lanes, Nw (max) (Exhibit 24-7)	3.50
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	46.02	mph
Weaving segment density, D	27.56	pc/mi/ln
Level of service, LOS	C	
Capacity of base condition, cb	5754	pc/h
Capacity as a 15-minute flow rate, c	5586	pc/h
Capacity as a full-hour volume, ch	5027	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	3555	4000	a
Average flow rate (pcphpl)	1268	2400	b
Volume ratio, VR	0.70	0.80	c
Weaving ratio, R	0.49	N/A	d
Weaving length (ft)	2300	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	2/21/2012
Analysis Time Period:	PM Peak Hour
Freeway/Dir of Travel:	I-77 SB
Weaving Location:	EB SR 18 On to SR 21 Off
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	4	
Weaving segment length, L	2300	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	B	
Volume ratio, VR	0.57	
Weaving ratio, R	0.23	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V_{o1}	V_{o2}	V_{w1}	V_{w2}	
Volume, V	2200	580	2850	850	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	611	161	792	236	v
Trucks and buses	6	3	3	6	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.971	0.985	0.985	0.971	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2517	654	3214	972	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.20	6.00
c (Exhibit 24-6)	0.70	1.00
d (Exhibit 24-6)	0.50	0.50
Weaving intensity factor, Wi	0.87	1.14
Weaving and non-weaving speeds, Si	47.14	42.98
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	2.65
Maximum number of lanes, Nw (max) (Exhibit 24-7)	3.50
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	45.25	mph
Weaving segment density, D	40.64	pc/mi/ln
Level of service, LOS	E	
Capacity of base condition, cb	7030	pc/h
Capacity as a 15-minute flow rate, c	6825	pc/h
Capacity as a full-hour volume, ch	6142	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	4186	4000	a
Average flow rate (pcphpl)	1839	2400	b
Volume ratio, VR	0.57	0.80	c
Weaving ratio, R	0.23	N/A	d
Weaving length (ft)	2300	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	2/21/2012
Analysis Time Period:	AM Peak Hour
Freeway/Dir of Travel:	I-77 NB
Weaving Location:	SR 21 On and SR 18 Off
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	4	
Weaving segment length, L	1300	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	C	
Volume ratio, VR	0.55	
Weaving ratio, R	0.07	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V o1	V o2	V w1	V w2	
Volume, V	2360	340	3070	250	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	656	94	853	69	v
Trucks and buses	6	3	6	3	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.971	0.985	0.971	0.985	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2700	383	3513	281	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	1.15	1.37
Weaving and non-weaving speeds, Si	42.87	40.33
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	2.63
Maximum number of lanes, Nw (max) (Exhibit 24-7)	3.00
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	41.69	mph
Weaving segment density, D	41.24	pc/mi/ln
Level of service, LOS	E	
Capacity of base condition, cb	6952	pc/h
Capacity as a 15-minute flow rate, c	6750	pc/h
Capacity as a full-hour volume, ch	6075	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	3794	3500	a
Average flow rate (pcphpl)	1719	2400	b
Volume ratio, VR	0.55	0.50	c
Weaving ratio, R	0.07	0.40	d
Weaving length (ft)	1300	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
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Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	2/21/2012
Analysis Time Period:	PM Peak Hour
Freeway/Dir of Travel:	I-77 NB
Weaving Location:	SR 21 On and SR 18 Off
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	4	
Weaving segment length, L	1300	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	C	
Volume ratio, VR	0.35	
Weaving ratio, R	0.08	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V_{o1}	V_{o2}	V_{w1}	V_{w2}	
Volume, V	2260	470	1320	120	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	628	131	367	33	v
Trucks and buses	6	2	6	2	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.971	0.990	0.971	0.990	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2586	527	1510	134	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.30	6.00
c (Exhibit 24-6)	0.80	1.10
d (Exhibit 24-6)	0.60	0.60
Weaving intensity factor, Wi	0.62	0.39
Weaving and non-weaving speeds, Si	52.07	58.22
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	2.41
Maximum number of lanes, Nw (max) (Exhibit 24-7)	3.00
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	55.94	mph
Weaving segment density, D	21.26	pc/mi/ln
Level of service, LOS	C	
Capacity of base condition, cb	8300	pc/h
Capacity as a 15-minute flow rate, c	8058	pc/h
Capacity as a full-hour volume, ch	7252	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	1644	3500	a
Average flow rate (pcphpl)	1189	2400	b
Volume ratio, VR	0.35	0.50	c
Weaving ratio, R	0.08	0.40	d
Weaving length (ft)	1300	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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Phone: Fax:
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Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	EB SR 18 Off-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	1180	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	328	v
Trucks and buses	3	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.985	
Driver population factor, fp	1.00	
Flow rate, vp	665	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	665	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	12.1	pc/mi/ln
Level of service, LOS	B	

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

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Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	EB SR 18 Off-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	1180	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	328	v
Trucks and buses	2	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.990	
Driver population factor, fp	1.00	
Flow rate, vp	662	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	662	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	12.0	pc/mi/ln
Level of service, LOS	B	

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

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Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	North of Ramp to SR 18 EB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	5430	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1508	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	2071	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2071	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	63.4	mi/h
Number of lanes, N	3	
Density, D	32.7	pc/mi/ln
Level of service, LOS	D	

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

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Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	North of Ramp to SR 18 EB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	3580	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	994	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	1366	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1366	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	70.0	mi/h
Number of lanes, N	3	
Density, D	19.5	pc/mi/ln
Level of service, LOS	C	

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

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Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	EB SR 18 On-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	900	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	250	v
Trucks and buses	4	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.980	
Driver population factor, fp	1.00	
Flow rate, vp	510	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	510	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	9.3	pc/mi/ln
Level of service, LOS	A	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
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Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	EB SR 18 On-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	440	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	122	v
Trucks and buses	3	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.985	
Driver population factor, fp	1.00	
Flow rate, vp	248	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	248	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	4.5	pc/mi/ln
Level of service, LOS	A	

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

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Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Dir of Travel:	I-77 NB
Weaving Location:	EB SR 18 On to WB SR 18 Off
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	4	
Weaving segment length, L	1000	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	
Volume ratio, VR	0.27	
Weaving ratio, R	0.28	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V o1	V o2	V w1	V w2	
Volume, V	4330	0	450	1100	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	1203	0	125	306	v
Trucks and buses	6	0	4	12	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.971	1.000	0.980	0.943	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	4955	0	510	1295	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.0035
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	1.36	0.80
Weaving and non-weaving speeds, Si	40.43	48.39
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		1.39
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	45.97	mph
Weaving segment density, D	36.76	pc/mi/ln
Level of service, LOS	E	
Capacity of base condition, cb	7487	pc/h
Capacity as a 15-minute flow rate, c	7269	pc/h

Capacity as a full-hour volume, ch 6542 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	1805	2800	a
Average flow rate (pcphpl)	1690	2400	b
Volume ratio, VR	0.27	0.35	c
Weaving ratio, R	0.28	N/A	d
Weaving length (ft)	1000	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Freeway Weaving Release 5.5

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Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Dir of Travel:	I-77 NB
Weaving Location:	EB SR 18 On to WB SR 18 Off
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	4	
Weaving segment length, L	1000	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	
Volume ratio, VR	0.41	
Weaving ratio, R	0.14	

Conversion to pc/h Under Base Conditions

	Non-Weaving V o1	V o2	Weaving V w1	V w2	
Volume, V	2240	0	1340	220	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	622	0	372	61	v
Trucks and buses	6	0	7	3	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.971	1.000	0.966	0.985	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2563	0	1540	248	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.35	0.0020
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	2.62	0.39
Weaving and non-weaving speeds, Si	31.57	58.01
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		1.72
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Constrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	43.16	mph
Weaving segment density, D	25.20	pc/mi/ln
Level of service, LOS	C	
Capacity of base condition, cb	6870	pc/h
Capacity as a 15-minute flow rate, c	6670	pc/h

Capacity as a full-hour volume, ch 6003 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	1788	2800	a
Average flow rate (pcphpl)	1087	2400	b
Volume ratio, VR	0.41	0.35	c
Weaving ratio, R	0.14	N/A	d
Weaving length (ft)	1000	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	WB SR 18 Off-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	2200	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	611	v
Trucks and buses	12	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1296	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1296	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	23.6	pc/mi/ln
Level of service, LOS	C	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	WB SR 18 Off-Ramp Vol/Lane DBL
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Flow Inputs and Adjustments

Volume, V	2680	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	744	v
Trucks and buses	7	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.966	
Driver population factor, fp	1.00	
Flow rate, vp	1541	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Measured	
FFS or BFFS	55.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	55.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1541	pc/h/ln
Free-flow speed, FFS	55.0	mi/h
Average passenger-car speed, S	55.0	mi/h
Number of lanes, N	2	
Density, D	28.0	pc/mi/ln
Level of service, LOS	D	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	North of Ramp to SR 18 WB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	4780	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1328	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	1823	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1823	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	67.6	mi/h
Number of lanes, N	3	
Density, D	27.0	pc/mi/ln
Level of service, LOS	D	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	North of Ramp to SR 18 WB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	2460	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	683	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	938	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	938	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	70.0	mi/h
Number of lanes, N	3	
Density, D	13.4	pc/mi/ln
Level of service, LOS	B	

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

HCS+: Ramps and Ramp Junctions Release 5.5

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date performed:	9/6/2011
Analysis time period:	AM Peak Hour
Freeway/Dir of Travel:	I-77 NB
Junction:	SR 18 WB to I-77 NB
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	70.0	mph
Volume on freeway	4780	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	190	vph
Length of first accel/decel lane	850	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

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

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4780	190		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1328	53		v
Trucks and buses	6	3		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.971	0.985		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	5470	214		pcph

Estimation of V12 Merge Areas

L_{EQ} = 1021.98 (Equation 25-2 or 25-3)

P_{FM} = 0.601 Using Equation 1

$v = v (P_{FM}) =$ 3289 pc/h

12 F FM

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		5684	7200	No
$v_{3 \text{ or } av34}$		2181 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$	v > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$	v > 1.5 v_{12} /2		No	
If yes, v_{12A} = 3289			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	5684	4600	No

Level of Service Determination (if not F)

Density, D_R = 5.475 + 0.00734 v_{R} + 0.0078 v_{12} - 0.00627 L_A = 27.4 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 = 59.1	mph
Space mean speed in outer lanes,	S_0 = 63.9	mph
Space mean speed for all vehicles,	S = 60.8	mph

HCS+: Ramps and Ramp Junctions Release 5.5

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date performed:	9/6/2011
Analysis time period:	PM Peak Hour
Freeway/Dir of Travel:	I-77 NB
Junction:	SR 18 WB to I-77 NB
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2460	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	310	vph
Length of first accel/decel lane	850	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

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

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2460	310		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	683	86		v
Trucks and buses	6	2		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.971	0.990		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	2815	348		pcph

Estimation of V12 Merge Areas

L_{EQ} = 482.48 (Equation 25-2 or 25-3)

P_{FM} = 0.601 Using Equation 1

$v = v (P_{FM}) =$ 1693 pc/h

12 F FM

Capacity Checks

		Actual	Maximum	LOS F?
v_{FO}		3163	7200	No
$v_{3 \text{ or } av34}$	v	1122 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$	v > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$	v > 1.5 v_{12} /2		No	
If yes, v_{12A} = 1693			(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3163	4600	No

Level of Service Determination (if not F)

Density, D_R = 5.475 + 0.00734 v_{R} + 0.0078 v_{12} - 0.00627 L_A = 15.9 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	M_S = 0.292	
Space mean speed in ramp influence area,	S_R = 61.8	mph
Space mean speed in outer lanes,	S_0 = 67.8	mph
Space mean speed for all vehicles,	S = 63.8	mph

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	North of Ramp from SR 18 WB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	4970	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1381	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	1896	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1896	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	66.6	mi/h
Number of lanes, N	3	
Density, D	28.5	pc/mi/ln
Level of service, LOS	D	

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

HCS+: Basic Freeway Segments Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency or Company:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Direction:	I-77 NB
From/To:	North of Ramp from SR 18 WB
Jurisdiction:	
Analysis Year:	2035
Description: Summit 18 Corridor Study PID 77749	

Flow Inputs and Adjustments

Volume, V	2770	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	769	v
Trucks and buses	6	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.971	
Driver population factor, fp	1.00	
Flow rate, vp	1057	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1057	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	70.0	mi/h
Number of lanes, N	3	
Density, D	15.1	pc/mi/ln
Level of service, LOS	B	

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

HCS+: Freeway Weaving Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Dir of Travel:	SR 18 WB
Weaving Location:	SR 18 WB at I-77 Loop Ramps
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	45	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1000	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	
Volume ratio, VR	0.77	
Weaving ratio, R	0.14	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V o1	V o2	V w1	V w2	
Volume, V	400	0	1100	180	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	111	0	306	50	v
Trucks and buses	3	0	12	4	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.985	1.000	0.943	0.980	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	451	0	1295	204	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.35	0.0020
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	2.61	0.50
Weaving and non-weaving speeds, Si	24.68	38.34
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		2.12
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Constrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	26.90	mph
Weaving segment density, D	24.16	pc/mi/ln
Level of service, LOS	C	
Capacity of base condition, cb	4180	pc/h
Capacity as a 15-minute flow rate, c	4118	pc/h

Capacity as a full-hour volume, ch 3706 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	1499	2800	a
Average flow rate (pcphpl)	650		b
Volume ratio, VR	0.77	0.45	c
Weaving ratio, R	0.14	N/A	d
Weaving length (ft)	1000	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Freeway Weaving Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Dir of Travel:	SR 18 WB
Weaving Location:	SR 18 WB at I-77 Loop Ramps
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	45	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1050	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	
Volume ratio, VR	0.61	
Weaving ratio, R	0.32	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V o1	V o2	V w1	V w2	
Volume, V	1310	0	1340	650	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	364	0	372	181	v
Trucks and buses	3	0	7	4	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.985	1.000	0.966	0.980	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1477	0	1540	736	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.35	0.0020
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	3.84	0.77
Weaving and non-weaving speeds, Si	22.23	34.80
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		1.97
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Constrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	25.92	mph
Weaving segment density, D	48.27	pc/mi/ln
Level of service, LOS	F	
Capacity of base condition, cb	4210	pc/h
Capacity as a 15-minute flow rate, c	4148	pc/h

Capacity as a full-hour volume, ch 3733 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	2276	2800	a
Average flow rate (pcphpl)	1251		b
Volume ratio, VR	0.61	0.45	c
Weaving ratio, R	0.32	N/A	d
Weaving length (ft)	1050	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Freeway Weaving Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	AM Peak Hour
Freeway/Dir of Travel:	SR 18 EB
Weaving Location:	SR 18 EB at I-77 Loop Ramps
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	45	mph
Weaving number of lanes, N	3	
Weaving segment length, L	600	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	
Volume ratio, VR	0.40	
Weaving ratio, R	0.29	

Conversion to pc/h Under Base Conditions

	Non-Weaving V o1	V o2	Weaving V w1	V w2	
Volume, V	950	0	450	180	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	264	0	125	50	v
Trucks and buses	3	0	4	8	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.985	1.000	0.980	0.962	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1071	0	510	208	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.0035
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.93	0.45
Weaving and non-weaving speeds, Si	33.14	39.11
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		1.27
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	36.47	mph
Weaving segment density, D	16.35	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	4076	pc/h
Capacity as a 15-minute flow rate, c	4016	pc/h

Capacity as a full-hour volume, ch 3614 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	718	2800	a
Average flow rate (pcphpl)	596		b
Volume ratio, VR	0.40	0.45	c
Weaving ratio, R	0.29	N/A	d
Weaving length (ft)	600	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Freeway Weaving Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	9/6/2011
Analysis Time Period:	PM Peak Hour
Freeway/Dir of Travel:	SR 18 EB
Weaving Location:	SR 18 EB at I-77 Loop Ramps
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	45	mph
Weaving number of lanes, N	3	
Weaving segment length, L	600	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	
Volume ratio, VR	0.30	
Weaving ratio, R	0.42	

Conversion to pc/h Under Base Conditions

	Non-Weaving V o1	V o2	Weaving V w1	V w2	
Volume, V	1190	0	300	220	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	331	0	83	61	v
Trucks and buses	3	0	4	3	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.985	1.000	0.980	0.985	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	1342	0	340	248	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.0035
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.85	0.37
Weaving and non-weaving speeds, Si	33.87	40.46
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		1.08
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	38.20	mph
Weaving segment density, D	16.84	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	4395	pc/h
Capacity as a 15-minute flow rate, c	4330	pc/h

Capacity as a full-hour volume, ch 3897 pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	588	2800	a
Average flow rate (pcphpl)	643		b
Volume ratio, VR	0.30	0.45	c
Weaving ratio, R	0.42	N/A	d
Weaving length (ft)	600	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Appendix D

Intersection LOS Analysis

No-Build Intersections

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/9/2011
Period: AM Peak
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18

Inter.: SR 18 and Heritage Woods Rd
Area Type: All other areas
Jurisd:
Year : 2035 No-Build
N/S St: Heritage Woods

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	0	1	2	0	0	1	1	1	1	0
LGConfig	L	TR		L	TR			LT	R	L	TR	
Volume	10	2350	40	120	1030	50	30	30	300	20	10	10
Lane Width	12.0	12.0		12.0	12.0			12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left		P			NB Left	P		
Thru		P			Thru	P		
Right		P			Right	P		
Peds					Peds			
WB Left	P	P			SB Left	P		
Thru	P	P			Thru	P		
Right	P	P			Right	P		
Peds					Peds			
NB Right	P				EB Right			
SB Right					WB Right			
Green	8.0	83.3				14.7		
Yellow	4.0	4.0				4.0		
All Red	0.0	1.0				1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	298	430	0.04	0.69	6.0	A		
TR	2409	3470	1.10	0.69	71.3	E	71.0	E
Westbound								
L	179	1752	0.74	0.80	65.5	E		
TR	2770	3488	0.43	0.79	4.4	A	10.5	B
Northbound								
LT	191	1563	0.35	0.12	53.1	D	70.9	E
R	365	1583	0.91	0.23	74.4	E		
Southbound								
L	163	1330	0.13	0.12	48.7	D		
TR	211	1723	0.10	0.12	47.8	D	48.2	D

Intersection Delay = 52.6 (sec/veh) Intersection LOS = D

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/9/2011
Analysis Time Period: AM Peak
Intersection: SR 18 and Heritage Woods Rd
Area Type: All other areas
Jurisdiction:
Analysis Year: 2035 No-Build
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18 N/S St: Heritage Woods

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	10	2350	40	120	1030	50	30	30	300	20	10	10
% Heavy Veh	4	4	4	3	3	3	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	3	653	11	33	286	14	8	8	83	6	3	3
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900			1900	1900	1900	1900	
ParkExist												
NumPark												
No. Lanes		1	2	0		1	2	0	0	1	1	0		1	1	0
LGConfig	L		TR		L		TR			LT	R		L		TR	
Lane Width	12.0	12.0			12.0	12.0				12.0	12.0		12.0	12.0		
RTOR Vol			0				0			0					0	
Adj Flow	11	2655			133	1200				66	333		22	22		
%InSharedLn																
Prop LTs	1.000	0.000			1.000	0.000				0.500			1.000	0.000		
Prop RTs		0.017				0.047				0.000	1.000			0.500		
Peds Bikes		0				0				0				0		
Buses	0	0			0	0				0	0		0	0		
%InProtPhase					0.0											

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Arriv. Type	3	3		3	3			3	3	3	3	
Unit Ext.	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Ext of g	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Ped Min g		3.2			3.2			3.2			3.2	

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/9/2011
Period: PM Peak
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18

Inter.: Heritage Woods and SR 18
Area Type: All other areas
Jurisd: ODOT
Year : 2035 No-Build
N/S St: Heritage Woods

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	0	1	2	0	0	1	1	1	1	0
LGConfig	L	TR		L	TR			LT	R	L	TR	
Volume	30	1710	30	310	2380	10	50	50	210	40	50	50
Lane Width	12.0	12.0		12.0	12.0			12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left		P			NB Left	P			
Thru		P			Thru	P			
Right		P			Right	P			
Peds					Peds				
WB Left	P	P			SB Left	P			
Thru	P	P			Thru	P			
Right	P	P			Right	P			
Peds					Peds				
NB Right	P				EB Right				
SB Right					WB Right				
Green	21.0	66.3				18.7			
Yellow	4.0	4.0				4.0			
All Red	0.0	1.0				1.0			

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	61	110	0.54	0.55	47.5	D		
TR	1917	3470	1.01	0.55	49.5	D	49.4	D
Westbound								
L	368	1752	0.93	0.77	65.3	E		
TR	2671	3510	0.99	0.76	30.1	C	34.2	C
Northbound								
LT	207	1327	0.54	0.16	56.5	E	38.4	D
R	590	1583	0.39	0.37	29.7	C		
Southbound								
L	180	1158	0.24	0.16	47.7	D		
TR	269	1723	0.42	0.16	50.4	D	49.6	D

Intersection Delay = 40.4 (sec/veh) Intersection LOS = D

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/9/2011
Analysis Time Period: PM Peak
Intersection: Heritage Woods and SR 18
Area Type: All other areas
Jurisdiction: ODOT
Analysis Year: 2035 No-Build
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18 N/S St: Heritage Woods

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	30	1710	30	310	2380	10	50	50	210	40	50	50
% Heavy Veh	4	4	4	3	3	3	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	8	475	8	86	661	3	14	14	58	11	14	14
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900			1900	1900	1900	1900	
ParkExist												
NumPark												
No. Lanes	1	2	0	1	2	0	0	1	1	1	1	0
LGConfig	L	TR		L	TR			LT	R	L	TR	
Lane Width	12.0	12.0		12.0	12.0			12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0
Adj Flow	33	1933		344	2655			112	233	44	112	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000			0.500		1.000	0.000	
Prop RTs		0.017			0.004			0.000	1.000		0.500	
Peds Bikes	0			0			0			0		
Buses	0	0		0	0			0	0	0	0	
%InProtPhase				0.0								

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Arriv. Type	3	3		3	3			3	3	3	3	
Unit Ext.	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Ext of g	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Ped Min g		3.2			3.2			3.2			3.2	

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/7/2011
Period: AM Peak
Project ID: Summit 18 Corridor Study
E/W St: SR 18

Inter.: Crystal Lake Road and SR 18
Area Type: All other areas
Jurisd:
Year : 2035 No-Build

N/S St: Crystal Lake Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	0	1	2	1	0	1	1	2	1	0
LGConfig	L	TR		L	T	R		LT	R	L	TR	
Volume	300	2340	30	170	980	550	40	20	260	550	20	180
Lane Width	12.0	12.0		12.0	12.0	12.0		12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4		5	6	7	8
EB	Left	P	P	P		NB	Left	P		
	Thru		P	P			Thru	P		
	Right		P	P			Right	P		
	Peds						Peds			
WB	Left	P		P		SB	Left	P		
	Thru			P			Thru	P	P	
	Right			P			Right	P	P	
	Peds						Peds			
NB	Right	P				EB	Right			
SB	Right					WB	Right	P		
Green		8.0	10.3	53.1				16.6	9.0	
Yellow		4.0	4.0	4.0				4.0	4.0	
All Red		0.0	1.0	1.0				0.0	1.0	

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	435	1752	0.77	0.67	37.9	D		
TR	1998	3506	1.32	0.57	172.5	F	157.3	F
Westbound								
L	179	1752	1.06	0.51	116.5	F		
T	1554	3512	0.70	0.44	29.7	C	34.3	C
R	976	1568	0.63	0.62	17.0	B		
Northbound								
LT	94	1249	0.70	0.08	89.8	F	98.9	F
R	290	1583	1.00	0.18	101.0	F		
Southbound								
L	475	3437	1.29	0.14	195.8	F		
TR	397	1611	0.56	0.25	45.1	D	155.6	F

Intersection Delay = 115.2 (sec/veh) Intersection LOS = F

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/7/2011
Analysis Time Period: AM Peak
Intersection: Crystal Lake Road and SR 18
Area Type: All other areas
Jurisdiction:
Analysis Year: 2035 No-Build
Project ID: Summit 18 Corridor Study
E/W St: SR 18 N/S St: Crystal Lake Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	300	2340	30	170	980	550	40	20	260	550	20	180
% Heavy Veh	3	3	3	3	3	3	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	83	650	8	47	272	153	11	6	72	153	6	50
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900	1900		1900	1900	1900	1900	
ParkExist												
NumPark												
No. Lanes	1	2	0	1	2	1	0	1	1	2	1	0
LGConfig	L	TR		L	T	R		LT	R	L	TR	
Lane Width	12.0	12.0		12.0	12.0	12.0		12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0
Adj Flow	333	2633		189	1089	611		66	289	611	222	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000			0.667			0.000	
Prop RTs		0.013			0.000	1.000		0.000	1.000		0.901	
Peds	Bikes	0			0			0			0	
Buses	0	0		0	0	0		0	0	0	0	
%InProtPhase	0.0			0.0								

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Arriv. Type	3	3		3	3	3		3	3	3	3	
Unit Ext.	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time	2.0	2.0		2.0	2.0	2.0		2.0	2.0	2.0	2.0	
Ext of g	2.0	2.0		2.0	2.0	2.0		2.0	2.0	2.0	2.0	
Ped Min g		3.2			3.2			3.2			3.2	

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/9/2011
Period: PM Peak
Project ID: Summit 18 Corridor Study
E/W St: SR 18

Inter.: Crystal Lake Road and SR 18
Area Type: All other areas
Jurisd:
Year : 2035 No-Build

N/S St: Crystal Lake Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	0	1	2	1	0	1	1	2	1	0
LGConfig	L	TR		L	T	R		LT	R	L	TR	
Volume	100	1820	40	360	2340	400	60	20	330	690	60	300
Lane Width	12.0	12.0		12.0	12.0	12.0		12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4		5	6	7	8
EB	Left	P		P		NB	Left	P		
	Thru			P			Thru	P		
	Right			P			Right	P		
	Peds						Peds			
WB	Left	P	P	P		SB	Left	P		
	Thru		P	P			Thru	P	P	
	Right		P	P			Right	P	P	
	Peds						Peds			
NB	Right	P	P			EB	Right			
SB	Right					WB	Right	P		
Green		8.0	5.0	53.8				18.2	14.0	
Yellow		4.0	3.0	4.0				4.0	4.0	
All Red		0.0	0.0	1.0				0.0	1.0	

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	178	1752	0.62	0.52	41.4	D		
TR	1570	3501	1.32	0.45	179.9	F	172.8	F
Westbound								
L	309	1752	1.29	0.63	195.1	F		
T	1809	3512	1.44	0.52	229.1	F	196.7	F
R	1111	1568	0.40	0.71	8.2	A		
Northbound								
LT	120	1027	0.74	0.12	84.7	F	56.6	E
R	475	1583	0.77	0.30	49.8	D		
Southbound								
L	521	3437	1.47	0.15	273.7	F		
TR	492	1630	0.81	0.30	52.5	D	197.8	F

Intersection Delay = 180.9 (sec/veh) Intersection LOS = F

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/9/2011
Analysis Time Period: PM Peak
Intersection: Crystal Lake Road and SR 18
Area Type: All other areas
Jurisdiction:
Analysis Year: 2035 No-Build
Project ID: Summit 18 Corridor Study
E/W St: SR 18 N/S St: Crystal Lake Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	100	1820	40	360	2340	400	60	20	330	690	60	300
% Heavy Veh	3	3	3	3	3	3	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	28	506	11	100	650	111	17	6	92	192	17	83
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900	1900		1900	1900	1900	1900	
ParkExist												
NumPark												
No. Lanes	1	2	0	1	2	1	0	1	1	2	1	0
LGConfig	L	TR		L	T	R		LT	R	L	TR	
Lane Width	12.0	12.0		12.0	12.0	12.0		12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0
Adj Flow	111	2066		400	2600	444		89	367	767	400	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000			0.753			0.000	
Prop RTs		0.021			0.000	1.000		0.000	1.000		0.832	
Peds	Bikes	0			0			0			0	
Buses	0	0		0	0	0		0	0	0	0	
%InProtPhase	0.0			0.0								

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Arriv. Type	3	3		3	3	3		3	3	3	3	
Unit Ext.	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time	2.0	2.0		2.0	2.0	2.0		2.0	2.0	2.0	2.0	
Ext of g	2.0	2.0		2.0	2.0	2.0		2.0	2.0	2.0	2.0	
Ped Min g		3.2			3.2			3.2			3.2	

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/9/2011
Period: AM Peak Hour
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18

Inter.: Springside Drive and SR 18
Area Type: All other areas
Jurisd: ODOT
Year : 2035 No-Build
N/S St: Springside Drive

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	0	1	3	0	1	1	0	1	1	0
LGConfig	L	TR		L	TR		L	TR		L	TR	
Volume	360	880	70	100	610	60	130	60	80	60	20	70
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	P	P			NB Left	P		
Thru	P	P			Thru	P		
Right	P	P			Right	P		
Peds					Peds			
WB Left		P			SB Left	P		
Thru		P			Thru	P		
Right		P			Right	P		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	16.0	46.7				43.3		
Yellow	4.0	4.0				4.0		
All Red	0.0	1.0				1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	449	1770	0.89	0.56	39.0	D		
TR	2789	5018	0.38	0.56	15.4	B	21.9	C
Westbound								
L	187	481	0.59	0.39	42.2	D		
TR	1948	5006	0.38	0.39	26.9	C	28.9	C
Northbound								
L	465	1290	0.31	0.36	29.3	C		
TR	614	1703	0.25	0.36	28.0	C	28.6	C
Southbound								
L	419	1161	0.16	0.36	26.8	C		
TR	594	1645	0.17	0.36	26.7	C	26.8	C

Intersection Delay = 25.0 (sec/veh) Intersection LOS = C

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/9/2011
Analysis Time Period: AM Peak Hour
Intersection: Springside Drive and SR 18
Area Type: All other areas
Jurisdiction: ODOT
Analysis Year: 2035 No-Build
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18 N/S St: Springside Drive

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	360	880	70	100	610	60	130	60	80	60	20	70
% Heavy Veh	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	100	244	19	28	169	17	36	17	22	17	6	19
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900		1900	1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	1	3	0	1	3	0	1	1	0	1	1	0
LGConfig	L	TR		L	TR		L	TR		L	TR	
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
RTOR Vol			0			0			0			0
Adj Flow	400	1056		111	745		144	156		67	100	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000		1.000	0.000		1.000	0.000	
Prop RTs	0.074			0.090			0.571			0.780		
Peds Bikes	0			0			0			0		
Buses	0	0		0	0		0	0		0	0	
%InProtPhase	0.0											

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Arriv. Type	3	3		3	3		3	3		3	3	
Unit Ext.	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Ext of g	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Ped Min g		3.2			3.2			3.2			3.2	

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/9/2011
Period: PM Peak Hour
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18

Inter.: Springside Drive and SR 18
Area Type: All other areas
Jurisd: ODOT
Year : 2035 No-Build
N/S St: Springside Drive

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	0	1	3	0	1	1	0	1	1	0
LGConfig	L	TR		L	TR		L	TR		L	TR	
Volume	270	1410	180	260	1590	60	410	100	160	150	70	270
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	P	P			NB Left	P	P	
Thru		P			Thru	P	P	
Right		P			Right	P	P	
Peds					Peds			
WB Left	P	P			SB Left		P	
Thru		P			Thru		P	
Right		P			Right		P	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	13.0	40.1				22.0	26.9	
Yellow	4.0	4.0				4.0	4.0	
All Red	0.0	1.0				0.0	1.0	

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	254	1770	1.18	0.48	150.7	F		
TR	1667	4988	1.06	0.33	79.9	E	90.1	F
Westbound								
L	254	1770	1.14	0.48	124.5	F		
TR	1686	5046	1.09	0.33	89.9	F	94.6	F
Northbound								
L	387	1770	1.18	0.45	140.0	F		
TR	745	1691	0.39	0.44	24.2	C	95.1	F
Southbound								
L	243	1086	0.69	0.22	57.4	E		
TR	368	1641	1.03	0.22	100.6	F	87.4	F

Intersection Delay = 92.3 (sec/veh) Intersection LOS = F

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/9/2011
Analysis Time Period: PM Peak Hour
Intersection: Springside Drive and SR 18
Area Type: All other areas
Jurisdiction: ODOT
Analysis Year: 2035 No-Build
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18 N/S St: Springside Drive

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	270	1410	180	260	1590	60	410	100	160	150	70	270
% Heavy Veh	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	75	392	50	72	442	17	114	28	44	42	19	75
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900		1900	1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	1	3	0	1	3	0	1	1	0	1	1	0
LGConfig	L	TR		L	TR		L	TR		L	TR	
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
RTOR Vol			0			0			0			0
Adj Flow	300	1767		289	1834		456	289		167	378	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000		1.000	0.000		1.000	0.000	
Prop RTs	0.113			0.037			0.616			0.794		
Peds Bikes	0			0			0			0		
Buses	0	0		0	0		0	0		0	0	
%InProtPhase	0.0			0.0			0.0					

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Arriv. Type	3	3		3	3		3	3		3	3	
Unit Ext.	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Ext of g	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Ped Min g		3.2			3.2			3.2			3.2	

HCS+: Unsignalized Intersections Release 5.5

TWO-WAY STOP CONTROL SUMMARY

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/6/2011
Analysis Time Period: AM Peak
Intersection: SR 18 and Scenic View Dr
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2035 No-Build
Project ID: Summit 18 Corridor Study PID 77749
East/West Street: SR 18
North/South Street: Scenic View Dr
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		2360	20	10	1060	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		2622	22	11	1177	
Percent Heavy Vehicles		--	--	4	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		2	0	1	2	
Configuration		T	TR	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10		40			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	11		44			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L		LR				
v (vph)		11		55				
C(m) (vph)		152		27				
v/c		0.07		2.04				
95% queue length		0.23		18.47				
Control Delay		30.5		2238				
LOS		D		F				
Approach Delay				2238				
Approach LOS				F				

HCS+: Unsignalized Intersections Release 5.5

TWO-WAY STOP CONTROL SUMMARY

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/6/2011
Analysis Time Period: PM Peak
Intersection: SR 18 and Scenic View Dr
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2035 No-Build
Project ID: Summit 18 Corridor Study PID 77749
East/West Street: SR 18
North/South Street: Scenic View Dr
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		1750	10	50	2430	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		1944	11	55	2700	
Percent Heavy Vehicles		--	--	4	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		2	0	1	2	
Configuration		T	TR	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0		20			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	0		22			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L		LR				
v (vph)		55		22				
C(m) (vph)		287		302				
v/c		0.19		0.07				
95% queue length		0.71		0.24				
Control Delay		20.5		17.9				
LOS		C		C				
Approach Delay				17.9				
Approach LOS				C				

Build Intersections

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/26/2011
Period: AM Peak Hour
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18

Inter.: SR 18 and Heritage Woods Rd
Area Type: All other areas
Jurisd:
Year : 2035 Build
N/S St: Heritage Woods

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	0	2	2	0	1	1	1	1	1	0
LGConfig	L	TR		L	TR		L	T	R	L	TR	
Volume	10	2320	70	210	990	50	70	30	580	20	10	10
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left		P			NB Left	P		
Thru		P			Thru	P		
Right		P			Right	P		
Peds					Peds			
WB Left	P				SB Left	P		
Thru	P	P			Thru	P		
Right	P	P			Right	P		
Peds					Peds			
NB Right	P				EB Right			
SB Right					WB Right			
Green	13.0	61.4	0.0		31.6	0.0		
Yellow	4.0	4.0			4.0			
All Red	0.0	1.0			1.0			

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	230	449	0.05	0.51	15.1	B		
TR	2535	4955	1.05	0.51	61.3	E	61.1	E
Westbound								
L	369	3403	0.63	0.11	59.2	E		
TR	2278	3487	0.51	0.65	11.6	B	19.6	B
Northbound								
L	364	1384	0.21	0.26	35.9	D		
T	491	1863	0.07	0.26	33.4	C	61.9	E
R	654	1583	0.98	0.41	66.5	E		
Southbound								
L	361	1370	0.06	0.26	33.4	C		
TR	454	1723	0.05	0.26	33.2	C	33.3	C

Intersection Delay = 49.1 (sec/veh) Intersection LOS = D

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/26/2011
Analysis Time Period: AM Peak Hour
Intersection: SR 18 and Heritage Woods Rd
Area Type: All other areas
Jurisdiction:
Analysis Year: 2035 Build
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18 N/S St: Heritage Woods

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	10	2320	70	210	990	50	70	30	580	20	10	10
% Heavy Veh	4	4	4	3	3	3	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	3	644	19	58	275	14	19	8	161	6	3	3
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900		1900	1900	1900	1900	1900	
ParkExist												
NumPark												
No. Lanes	1	3	0	2	2	0	1	1	1	1	1	0
LGConfig	L	TR		L	TR		L	T	R	L	TR	
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0
Adj Flow	11	2656		233	1156		78	33	644	22	22	
%InSharedLn												
Prop LTs	1.000	0.000			0.000		1.000	0.000		1.000	0.000	
Prop RTs		0.029			0.048			0.000	1.000		0.500	
Peds Bikes	0			0			0			0		
Buses	0	0		0	0		0	0	0	0	0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Arriv. Type	3	3		3	3		3	3	3	3	3	
Unit Ext.	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Ext of g	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Ped Min g		3.2			3.2			3.2			3.2	

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/26/2011
Period: PM Peak Hour
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18

Inter.: SR 18 and Heritage Woods Rd
Area Type: All other areas
Jurisd:
Year : 2035 Build
N/S St: Heritage Woods

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	0	2	2	0	1	1	1	1	1	0
LGConfig	L	TR		L	TR		L	T	R	L	TR	
Volume	30	1670	70	730	2320	10	110	50	560	40	50	50
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left		P			NB Left	P		
Thru		P			Thru	P		
Right		P			Right	P		
Peds					Peds			
WB Left	P				SB Left	P		
Thru	P	P			Thru	P		
Right	P	P			Right	P		
Peds					Peds			
NB Right	P				EB Right			
SB Right					WB Right			
Green	31.9	50.9				23.2	0.0	
Yellow	4.0	4.0				4.0		
All Red	0.0	1.0				1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	61	144	0.54	0.42	56.1	E		
TR	2098	4946	0.92	0.42	40.9	D	41.1	D
Westbound								
L	905	3403	0.90	0.27	55.8	E		
TR	2539	3510	1.02	0.72	39.6	D	43.5	D
Northbound								
L	231	1197	0.53	0.19	51.9	D		
T	360	1863	0.16	0.19	41.2	D	35.9	D
R	793	1583	0.78	0.50	32.3	C		
Southbound								
L	259	1342	0.17	0.19	41.8	D		
TR	333	1723	0.34	0.19	44.5	D	43.7	D

Intersection Delay = 41.8 (sec/veh) Intersection LOS = D

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/26/2011
Analysis Time Period: PM Peak Hour
Intersection: SR 18 and Heritage Woods Rd
Area Type: All other areas
Jurisdiction:
Analysis Year: 2035 Build
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18 N/S St: Heritage Woods

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	30	1670	70	730	2320	10	110	50	560	40	50	50
% Heavy Veh	4	4	4	3	3	3	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	8	464	19	203	644	3	31	14	156	11	14	14
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900		1900	1900	1900	1900	1900	
ParkExist												
NumPark												
No. Lanes	1	3	0	2	2	0	1	1	1	1	1	0
LGConfig	L	TR		L	TR		L	T	R	L	TR	
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	
RTOR Vol			0			0			0			0
Adj Flow	33	1934		811	2589		122	56	622	44	112	
%InSharedLn												
Prop LTs	1.000	0.000			0.000		1.000	0.000		1.000	0.000	
Prop RTs		0.040			0.004			0.000	1.000		0.500	
Peds Bikes	0			0			0			0		
Buses	0	0		0	0		0	0	0	0	0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Arriv. Type	3	3		3	3		3	3	3	3	3	
Unit Ext.	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
I Factor		1.000			1.000			1.000			1.000	
Lost Time	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Ext of g	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Ped Min g		3.2			3.2			3.2			3.2	

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/26/2011
Period: AM Peak Hour
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18

Inter.: SR 18 and Crystal Lake Rd
Area Type: All other areas
Jurisd:
Year : 2035 Build
N/S St: Crystal Lake Rd

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	0	0	3	1	0	0	0	2	0	1
LGConfig	L	T			T	R				L		R
Volume	510	2600			1150	550				550		200
Lane Width	12.0	12.0			12.0	12.0				12.0		12.0
RTOR Vol						0						0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	P	P			NB Left				
Thru	P	P			Thru				
Right					Right				
Peds					Peds				
WB Left					SB Left	P			
Thru		P			Thru				
Right		P			Right	P			
Peds					Peds				
NB Right					EB Right				
SB Right	P				WB Right	P			
Green	38.3	36.7	0.0			31.0	0.0		
Yellow	4.0	4.0				4.0			
All Red	0.0	1.0				1.0			

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	621	1752	0.91	0.67	52.3	D		
T	3308	5025	0.87	0.66	20.0+	C	25.3	C
Westbound								
T	1537	5025	0.83	0.31	44.2	D	35.9	D
R	950	1568	0.64	0.61	18.6	B		
Northbound								
Southbound								
L	888	3437	0.69	0.26	44.5	D		
							35.5	D
R	980	1583	0.23	0.62	10.7	B		

Intersection Delay = 29.9 (sec/veh) Intersection LOS = C

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/26/2011
Analysis Time Period: AM Peak Hour
Intersection: SR 18 and Crystal Lake Rd
Area Type: All other areas
Jurisdiction:
Analysis Year: 2035 Build
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18 N/S St: Crystal Lake Rd

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	510	2600			1150	550				550		200
% Heavy Veh	3	3			3	3				2		2
PHF	0.90	0.90			0.90	0.90				0.90		0.90
PK 15 Vol	142	722			319	153				153		56
Hi Ln Vol												
% Grade		0			0						0	
Ideal Sat	1900	1900			1900	1900				1900		1900
ParkExist												
NumPark												
No. Lanes	1	3	0	0	3	1	0	0	0	2	0	1
LGConfig	L	T			T	R				L		R
Lane Width	12.0	12.0			12.0	12.0				12.0		12.0
RTOR Vol						0						0
Adj Flow	567	2889			1278	611				611		222
%InSharedLn												
Prop LTs	1.000	0.000			0.000							
Prop RTs		0.000		0.000		1.000						1.000
Peds Bikes				0			0			0		
Buses	0	0			0	0				0		0
%InProtPhase	0.0											

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0			0.0	0.0				0.0		0.0
Arriv. Type	3	3			3	3				3		3
Unit Ext.	3.0	3.0			3.0	3.0				3.0		3.0
I Factor		1.000			1.000						1.000	
Lost Time	2.0	2.0			2.0	2.0				2.0		2.0
Ext of g	2.0	2.0			2.0	2.0				2.0		2.0
Ped Min g					3.2			3.2			3.2	

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/26/2011
Period: PM Peak Hour
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18

Inter.: SR 18 and Crystal Lake Rd
Area Type: All other areas
Jurisd:
Year : 2035 Build
N/S St: Crystal Lake Rd

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	0	0	3	1	0	0	0	2	0	1
LGConfig	L	T			T	R				L		R
Volume	120	2150			2700	400				690		360
Lane Width	12.0	12.0			12.0	12.0				12.0		12.0
RTOR Vol						0						0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	P	P			NB Left			
Thru	P	P			Thru			
Right					Right			
Peds					Peds			
WB Left					SB Left	P		
Thru		P			Thru			
Right		P			Right	P		
Peds					Peds			
NB Right					EB Right			
SB Right	P				WB Right	P		
Green	9.0	67.8	0.0		29.2	0.0		
Yellow	4.0	4.0			4.0			
All Red	0.0	1.0			1.0			

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	192	1752	0.69	0.68	52.5	D		
T	3384	5025	0.71	0.67	13.5	B	15.5	B
Westbound								
T	2839	5025	1.06	0.56	60.4	E	52.9	D
R	1333	1568	0.33	0.85	2.6	A		
Northbound								
Southbound								
L	836	3437	0.92	0.24	60.8	E		
							53.6	D
R	570	1583	0.70	0.36	39.9	D		

Intersection Delay = 39.8 (sec/veh) Intersection LOS = D

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/26/2011
Analysis Time Period: PM Peak Hour
Intersection: SR 18 and Crystal Lake Rd
Area Type: All other areas
Jurisdiction:
Analysis Year: 2035 Build
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18 N/S St: Crystal Lake Rd

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	120	2150			2700	400				690		360
% Heavy Veh	3	3			3	3				2		2
PHF	0.90	0.90			0.90	0.90				0.90		0.90
PK 15 Vol	33	597			750	111				192		100
Hi Ln Vol												
% Grade		0			0						0	
Ideal Sat	1900	1900			1900	1900				1900		1900
ParkExist												
NumPark												
No. Lanes	1	3	0	0	3	1	0	0	0	2	0	1
LGConfig	L	T			T	R				L		R
Lane Width	12.0	12.0			12.0	12.0				12.0		12.0
RTOR Vol						0						0
Adj Flow	133	2389			3000	444				767		400
%InSharedLn												
Prop LTs	1.000	0.000			0.000							
Prop RTs		0.000		0.000		1.000						1.000
Peds Bikes				0			0			0		
Buses	0	0			0	0				0		0
%InProtPhase	0.0											

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0			0.0	0.0				0.0		0.0
Arriv. Type	3	3			3	3				3		3
Unit Ext.	3.0	3.0			3.0	3.0				3.0		3.0
I Factor		1.000			1.000						1.000	
Lost Time	2.0	2.0			2.0	2.0				2.0		2.0
Ext of g	2.0	2.0			2.0	2.0				2.0		2.0
Ped Min g					3.2			3.2			3.2	

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/26/2011
Period: AM Peak Hour
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18

Inter.: SR 18 and Crystal Lake Rd
Area Type: All other areas
Jurisd:
Year : 2035 Build - WB Adjusted
N/S St: Crystal Lake Rd

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	0	0	2	1	0	0	0	2	0	1
LGConfig	L	T			T	R				L		R
Volume	510	2600			860	550				550		200
Lane Width	12.0	12.0			12.0	12.0				12.0		12.0
RTOR Vol						0						0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	P	P			NB Left			
Thru	P	P			Thru			
Right					Right			
Peds					Peds			
WB Left					SB Left	P		
Thru		P			Thru			
Right		P			Right	P		
Peds					Peds			
NB Right					EB Right			
SB Right	P				WB Right	P		
Green	38.3	37.7	0.0		30.0	0.0		
Yellow	4.0	4.0			4.0			
All Red	0.0	1.0			1.0			

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	621	1752	0.91	0.68	52.5	D		
T	3350	5025	0.86	0.67	18.9	B	24.4	C
Westbound								
T	1103	3512	0.87	0.31	48.0	D	36.5	D
R	950	1568	0.64	0.61	18.6	B		
Northbound								
Southbound								
L	859	3437	0.71	0.25	46.0	D		
							36.7	D
R	967	1583	0.23	0.61	11.1	B		

Intersection Delay = 29.4 (sec/veh) Intersection LOS = C

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/26/2011
Analysis Time Period: AM Peak Hour
Intersection: SR 18 and Crystal Lake Rd
Area Type: All other areas
Jurisdiction:
Analysis Year: 2035 Build - WB Adjusted
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18 N/S St: Crystal Lake Rd

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	510	2600			860	550				550		200
% Heavy Veh	3	3			3	3				2		2
PHF	0.90	0.90			0.90	0.90				0.90		0.90
PK 15 Vol	142	722			239	153				153		56
Hi Ln Vol												
% Grade		0			0						0	
Ideal Sat	1900	1900			1900	1900				1900		1900
ParkExist												
NumPark												
No. Lanes	1	3	0	0	2	1	0	0	0	2	0	1
LGConfig	L	T			T	R				L		R
Lane Width	12.0	12.0			12.0	12.0				12.0		12.0
RTOR Vol						0						0
Adj Flow	567	2889			956	611				611		222
%InSharedLn												
Prop LTs	1.000	0.000			0.000							
Prop RTs		0.000		0.000		1.000						1.000
Peds Bikes				0			0			0		
Buses	0	0			0	0				0		0
%InProtPhase	0.0											

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0			0.0	0.0				0.0		0.0
Arriv. Type	3	3			3	3				3		3
Unit Ext.	3.0	3.0			3.0	3.0				3.0		3.0
I Factor		1.000			1.000						1.000	
Lost Time	2.0	2.0			2.0	2.0				2.0		2.0
Ext of g	2.0	2.0			2.0	2.0				2.0		2.0
Ped Min g					3.2			3.2			3.2	

HCS+: Signalized Intersections Release 5.5

Analyst: RMK
Agency: Burgess & Niple Inc
Date: 9/26/2011
Period: PM Peak Hour
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18

Inter.: SR 18 and Crystal Lake Rd
Area Type: All other areas
Jurisd:
Year : 2035 Build - WB Adjusted
N/S St: Crystal Lake Rd

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	0	0	2	1	0	0	0	2	0	1
LGConfig	L	T			T	R				L		R
Volume	120	2150			2030	400				690		360
Lane Width	12.0	12.0			12.0	12.0				12.0		12.0
RTOR Vol						0						0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	P	P			NB Left			
Thru	P	P			Thru			
Right					Right			
Peds					Peds			
WB Left					SB Left	P		
Thru		P			Thru			
Right		P			Right	P		
Peds					Peds			
NB Right					EB Right			
SB Right	P				WB Right	P		
Green	8.0	70.6	0.0			27.4	0.0	
Yellow	4.0	4.0				4.0		
All Red	0.0	1.0				1.0		

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	179	1752	0.74	0.70	59.6	E		
T	3459	5025	0.69	0.69	12.3	B	14.8	B
Westbound								
T	2066	3512	1.09	0.59	74.7	E	62.8	E
R	1346	1568	0.33	0.86	2.3	A		
Northbound								
Southbound								
L	785	3437	0.98	0.23	73.0	E		
							63.3	E
R	533	1583	0.75	0.34	44.7	D		

Intersection Delay = 43.9 (sec/veh) Intersection LOS = D

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/26/2011
Analysis Time Period: PM Peak Hour
Intersection: SR 18 and Crystal Lake Rd
Area Type: All other areas
Jurisdiction:
Analysis Year: 2035 Build - WB Adjusted
Project ID: Summit 18 Corridor Study PID 77749
E/W St: SR 18 N/S St: Crystal Lake Rd

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	120	2150			2030	400				690		360
% Heavy Veh	3	3			3	3				2		2
PHF	0.90	0.90			0.90	0.90				0.90		0.90
PK 15 Vol	33	597			564	111				192		100
Hi Ln Vol												
% Grade		0			0						0	
Ideal Sat	1900	1900			1900	1900				1900		1900
ParkExist												
NumPark												
No. Lanes	1	3	0	0	2	1	0	0	0	2	0	1
LGConfig	L	T			T	R				L		R
Lane Width	12.0	12.0			12.0	12.0				12.0		12.0
RTOR Vol						0						0
Adj Flow	133	2389			2256	444				767		400
%InSharedLn												
Prop LTs	1.000	0.000			0.000							
Prop RTs		0.000		0.000		1.000						1.000
Peds Bikes				0			0			0		
Buses	0	0			0	0				0		0
%InProtPhase	0.0											

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet	0.0	0.0			0.0	0.0				0.0		0.0
Arriv. Type	3	3			3	3				3		3
Unit Ext.	3.0	3.0			3.0	3.0				3.0		3.0
I Factor		1.000			1.000						1.000	
Lost Time	2.0	2.0			2.0	2.0				2.0		2.0
Ext of g	2.0	2.0			2.0	2.0				2.0		2.0
Ped Min g					3.2			3.2			3.2	

HCS+: Unsignalized Intersections Release 5.5

TWO-WAY STOP CONTROL SUMMARY

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/6/2011
Analysis Time Period: AM Peak
Intersection: SR 18 and Scenic View Dr
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2035 Build
Project ID: Summit 18 Corridor Study PID 77749
East/West Street: SR 18
North/South Street: Scenic View Dr
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		2360	20	10	1060	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		2622	22	11	1177	
Percent Heavy Vehicles		--	--	4	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		2	0	1	2	
Configuration		T	TR	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10		40			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	11		44			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L		LR				
v (vph)		11		55				
C(m) (vph)		152		27				
v/c		0.07		2.04				
95% queue length		0.23		18.47				
Control Delay		30.5		2238				
LOS		D		F				
Approach Delay				2238				
Approach LOS				F				

HCS+: Unsignalized Intersections Release 5.5

TWO-WAY STOP CONTROL SUMMARY

Analyst: RMK
Agency/Co.: Burgess & Niple Inc
Date Performed: 9/6/2011
Analysis Time Period: PM Peak
Intersection: SR 18 and Scenic View Dr
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2035 Build
Project ID: Summit 18 Corridor Study PID 77749
East/West Street: SR 18
North/South Street: Scenic View Dr
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		1750	10	50	2430	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		1944	11	55	2700	
Percent Heavy Vehicles		--	--	4	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		2	0	1	2	
Configuration		T	TR	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0		20			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	0		22			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L		LR				
v (vph)		55		22				
C(m) (vph)		287		302				
v/c		0.19		0.07				
95% queue length		0.71		0.24				
Control Delay		20.5		17.9				
LOS		C		C				
Approach Delay				17.9				
Approach LOS				C				

Appendix E

Constrained Traffic Analysis

Constrained Traffic Calculations

SB I-77 On-Ramp AM

The intersection of SR 18 @ Crystal Lake Road constrains traffic entering SB I-77. However, the downstream weaving section on I-77 is LOS C under full demand volumes. Because the full demand volumes yield and acceptable LOS, **no check of constrained analysis is necessary**.

SB I-77 On-Ramp PM

No-Build Condition (SR 18 @ Crystal Lake Road

EB Thru v/c = 1.32
NB Right v/c = 0.77 (No Constraint)
SB Left v/c = 1.47

Assume 50.35% diversion to interstate based on 2035 PM traffic plates DHV

EB Thru = 1820 * 0.5035 = 916
SB Left = 690 * 0.5035 = 348
NB Right = 330 * 0.5035 = 166
Total = 916+348+166 = **1430 = Full demand ramp volume**

Constrained (No-Build Ramp Volume):
EB Thru = 916/1.32 = 694 vehicles
SB Left = 348/1.47 = 237 vehicles
NB Right = 166 vehicles
Total entering freeway = 694+237+166 = **1097 vehicles in PM No-Build condition**

Operation for freeway weaving segment under constrained condition is **LOS E**

Build Condition (SR 18 @ Crystal Lake Road)

EB Thru v/c = 0.71 (No Constraint)
NB Right v/c = N/A (Approach Removed)
SB Left v/c = 0.92 (No Constraint)

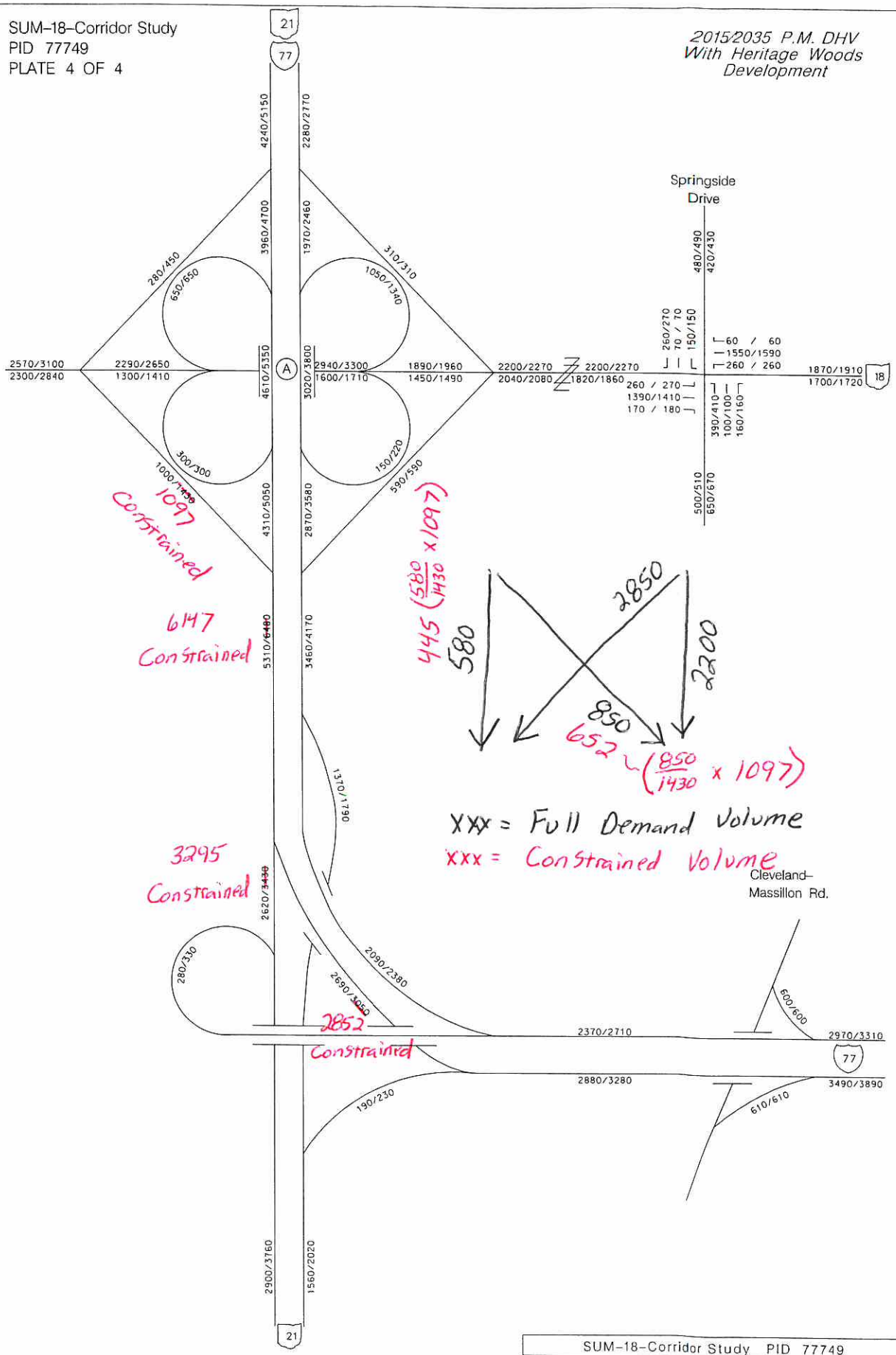
The Build condition will operate with full demand traffic of 1430 because all v/c ratios are less than 1.0.

Operation for freeway weaving segment under full demand traffic condition is **LOS E**

LOS No-Build (Constrained) = LOS Build, Therefore No Degradation occurs to the freeway segment

SUM–18–Corridor Study
PID 77749
PLATE 4 OF 4

2015/2035 P.M. DHV
With Heritage Woods
Development



SUM–18–Corridor Study PID 77749	
2015/2035 P.M. DHV	
OHIO DEPARTMENT OF TRANSPORTATION	
OFFICE OF STATEWIDE PLANNING & RESEARCH	
MAY 9, 2011	NOT TO SCALE

HCS+: Freeway Weaving Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	2/21/2012
Analysis Time Period:	PM No-Build (Constrained)
Freeway/Dir of Travel:	I-77 SB
Weaving Location:	EB SR 18 On to SR 21 Off
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	4	
Weaving segment length, L	2300	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	B	
Volume ratio, VR	0.57	
Weaving ratio, R	0.19	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V o1	V o2	V w1	V w2	
Volume, V	2200	445	2850	652	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	611	124	792	181	v
Trucks and buses	6	3	3	6	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.971	0.985	0.985	0.971	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2517	501	3214	746	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.20	6.00
c (Exhibit 24-6)	0.70	1.00
d (Exhibit 24-6)	0.50	0.50
Weaving intensity factor, Wi	0.83	1.08
Weaving and non-weaving speeds, Si	47.73	43.86
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	2.62
Maximum number of lanes, Nw (max) (Exhibit 24-7)	3.50
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	45.97	mph
Weaving segment density, D	37.95	pc/mi/ln
Level of service, LOS	E	
Capacity of base condition, cb	7047	pc/h
Capacity as a 15-minute flow rate, c	6842	pc/h
Capacity as a full-hour volume, ch	6158	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	3960	4000	a
Average flow rate (pcphpl)	1744	2400	b
Volume ratio, VR	0.57	0.80	c
Weaving ratio, R	0.19	N/A	d
Weaving length (ft)	2300	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Freeway Weaving Release 5.5

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	RMK
Agency/Co.:	Burgess & Niple Inc
Date Performed:	2/21/2012
Analysis Time Period:	PM Peak Hour
Freeway/Dir of Travel:	I-77 SB
Weaving Location:	EB SR 18 On to SR 21 Off
Jurisdiction:	
Analysis Year:	2035
Description:	Summit 18 Corridor Study PID 77749

Full Demand

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	4	
Weaving segment length, L	2300	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	B	
Volume ratio, VR	0.57	
Weaving ratio, R	0.23	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V_{o1}	V_{o2}	V_{w1}	V_{w2}	
Volume, V	2200	580	2850	850	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	611	161	792	236	v
Trucks and buses	6	3	3	6	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.971	0.985	0.985	0.971	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2517	654	3214	972	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.08	0.0020
b (Exhibit 24-6)	2.20	6.00
c (Exhibit 24-6)	0.70	1.00
d (Exhibit 24-6)	0.50	0.50
Weaving intensity factor, Wi	0.87	1.14
Weaving and non-weaving speeds, Si	47.14	42.98
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	2.65
Maximum number of lanes, Nw (max) (Exhibit 24-7)	3.50
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	45.25	mph
Weaving segment density, D	40.64	pc/mi/ln
Level of service, LOS	E	
Capacity of base condition, cb	7030	pc/h
Capacity as a 15-minute flow rate, c	6825	pc/h
Capacity as a full-hour volume, ch	6142	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	4186	4000	a
Average flow rate (pcphpl)	1839	2400	b
Volume ratio, VR	0.57	0.80	c
Weaving ratio, R	0.23	N/A	d
Weaving length (ft)	2300	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Appendix F

Storage Length Calculations

SR 18 Storage Length Calculations

Intersection	Approach	Turn Movement	# Turn Lanes	# Thru Lanes	Turn Volume	Thru Volume	Cycle Length	Turn Vehicles per Cycle	Req'd Storage Length Type B	Req'd Storage Length Type C	Req'd Storage Leght (per lane)	Thru Vehicles per Cycle per Lane	Thru Lane Back of Queue	Turn Lane Decel and Storage Req'd for Thru	Turn Lane Decel and Storage Provided
State Route 18 & Heritage Woods Road & Akron General	EB	Left	1	3	30	2390	120	1.0	225	193	225	26.6	975	**975**	600
	WB	Left	2	2	730	2330	120	24.3	225	968	484	38.8	1250	**1250**	1525
SR 18 & Crystal Lake Road	EB	Left	1	3	320	2600	120	10.7	225	543	543	28.9	975	**975**	350
	WB	Right	1	3	550	2700	120	18.3	225	793	793	30.0	975	**975**	450

Appendix G

Synchro/SimTraffic Analysis

Intersection: 25: SR 18 & Crystal Lake, Interval #1

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	T	T	R	L	L	R
Maximum Queue (ft)	266	96	140	137	269	305	318	228	200	218	151
Average Queue (ft)	150	77	82	96	150	216	232	153	146	142	68
95th Queue (ft)	248	112	141	148	290	294	304	269	204	190	117
Link Distance (ft)		596	596	596	597	597	597		2638	2638	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	315							450			300
Storage Blk Time (%)											
Queuing Penalty (veh)											

Intersection: 25: SR 18 & Crystal Lake, Interval #2

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	T	T	R	L	L	R
Maximum Queue (ft)	267	140	116	116	314	287	286	246	544	591	325
Average Queue (ft)	183	95	77	102	164	213	214	195	422	458	169
95th Queue (ft)	295	143	112	120	302	296	296	297	563	607	401
Link Distance (ft)		596	596	596	597	597	597		2638	2638	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	315							450			300
Storage Blk Time (%)										33	0
Queuing Penalty (veh)										73	0

Intersection: 25: SR 18 & Crystal Lake, Interval #3

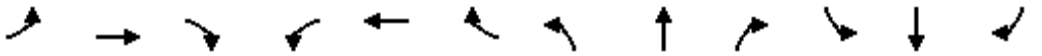
Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	T	T	R	L	L	R
Maximum Queue (ft)	286	96	112	141	270	312	348	244	346	347	324
Average Queue (ft)	215	73	87	104	189	256	287	184	184	192	106
95th Queue (ft)	311	100	109	142	284	317	377	264	320	335	261
Link Distance (ft)		596	596	596	597	597	597		2638	2638	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	315							450			300
Storage Blk Time (%)										3	
Queuing Penalty (veh)										5	

Intersection: 25: SR 18 & Crystal Lake, Interval #4

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	T	T	R	L	L	R
Maximum Queue (ft)	240	103	120	138	203	270	263	184	265	282	171
Average Queue (ft)	175	81	93	105	140	210	206	105	207	230	91
95th Queue (ft)	261	109	131	137	231	271	274	188	272	306	189
Link Distance (ft)		596	596	596	597	597	597		2638	2638	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	315							450			300
Storage Blk Time (%)										0	
Queuing Penalty (veh)										0	

Intersection: 25: SR 18 & Crystal Lake, All Intervals

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	T	T	R	L	L	R
Maximum Queue (ft)	286	140	140	141	314	312	348	246	544	591	325
Average Queue (ft)	181	82	85	102	161	224	235	159	240	255	108
95th Queue (ft)	287	119	126	139	283	301	329	272	447	485	270
Link Distance (ft)		596	596	596	597	597	597		2638	2638	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	315							450			300
Storage Blk Time (%)										9	0
Queuing Penalty (veh)										19	0

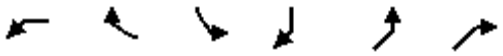


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	1370	50	140	920	10	80	0	1000	10	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	330		125	150		0	50		0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3456	0	1770	3438	1583	1770	0	1583	1770	0	1583
Flt Permitted	0.280			0.082			0.950			0.950		
Satd. Flow (perm)	522	3456	0	153	3438	1583	1770	0	1583	1770	0	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			35			30	
Link Distance (ft)		1287			951			2174			424	
Travel Time (s)		19.5			14.4			42.4			9.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	4%	2%	2%	5%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	22	1522	56	156	1022	11	89	0	1111	11	0	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	1578	0	156	1022	11	89	0	1111	11	0	11
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm			pm+pt		Perm	custom		custom	custom		custom
Protected Phases		2		1	6				1 8			
Permitted Phases	2			6		6	8			4		4
Minimum Split (s)	30.0	30.0		13.0	30.0	30.0	13.0			13.0		13.0
Total Split (s)	49.0	49.0	0.0	25.0	74.0	74.0	46.0	0.0	71.0	46.0	0.0	46.0
Total Split (%)	40.8%	40.8%	0.0%	20.8%	61.7%	61.7%	38.3%	0.0%	59.2%	38.3%	0.0%	38.3%
Maximum Green (s)	44.0	44.0		20.0	69.0	69.0	41.0			41.0		41.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0			4.0		4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0			1.0		1.0
Lost Time Adjust (s)	-2.0	-2.0	0.0	0.0	-2.0	0.0	-2.0	-2.0	0.0	-2.0	-2.0	0.0
Total Lost Time (s)	3.0	3.0	4.0	5.0	3.0	5.0	3.0	2.0	5.0	3.0	2.0	5.0
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Act Effct Green (s)	46.0	46.0		69.0	71.0	69.0	43.0		66.0	43.0		41.0
Actuated g/C Ratio	0.38	0.38		0.58	0.59	0.58	0.36		0.55	0.36		0.34
v/c Ratio	0.11	1.19		0.44	0.50	0.01	0.14		1.28	0.02		0.02
Control Delay	25.8	127.9		19.2	11.6	2.9	26.8		159.7	25.1		26.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	25.8	127.9		19.2	11.6	2.9	26.8		159.7	25.1		26.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	F		B	B	A	C		F	C		C
Approach Delay		126.5			12.5							
Approach LOS		F			B							

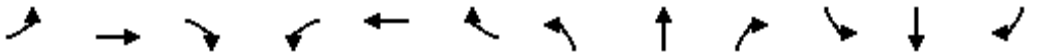
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 76 (63%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 130			
Control Type: Pretimed			
Maximum v/c Ratio: 1.28			
Intersection Signal Delay: 99.1		Intersection LOS: F	
Intersection Capacity Utilization 115.5%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 2: SR 18 & S. Hametown



Lane Group	WBL	WBR	SBL	SBR	NEL	NER
Lane Configurations						
Volume (vph)	0	320	220	170	360	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00
Frt	0.865		0.989	0.850		
Flt Protected			0.956		0.950	
Satd. Flow (prot)	1611	0	1761	1504	1770	0
Flt Permitted			0.956		0.950	
Satd. Flow (perm)	1611	0	1761	1504	1770	0
Link Speed (mph)	25		25		25	
Link Distance (ft)	1228		464		448	
Travel Time (s)	33.5		12.7		12.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	356	244	189	400	0
Shared Lane Traffic (%)				10%		
Lane Group Flow (vph)	356	0	263	170	400	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(ft)	12		24		12	
Link Offset(ft)	0		0		0	
Crosswalk Width(ft)	16		16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15	9
Sign Control	Yield		Yield		Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 65.4%		ICU Level of Service C	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	2320	70	310	990	50	70	30	580	10	10	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	600		0	270		0	250		250	50		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	0.97	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.993				0.850		0.925	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5017	0	3433	3450	0	1770	1863	1583	1770	1723	0
Flt Permitted	0.245			0.950			0.743			0.736		
Satd. Flow (perm)	456	5017	0	3433	3450	0	1384	1863	1583	1371	1723	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		719			684			464			388	
Travel Time (s)		10.9			10.4			12.7			10.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	3%	2%	2%	4%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	11	2578	78	344	1100	56	78	33	644	11	11	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	2656	0	344	1156	0	78	33	644	11	22	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1		1	1		1	1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	50	50		50	50		50	50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Turn Type	Perm			Prot			Perm		pm+ov	Perm		
Protected Phases		2		1	6			8	1		4	
Permitted Phases	2						8		8	4		
Detector Phase	2	2		1	6		8	8	1	4	4	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	
Minimum Split (s)	20.0	20.0		13.0	32.0		14.0	14.0	13.0	14.0	14.0	
Total Split (s)	65.0	65.0	0.0	18.0	83.0	0.0	37.0	37.0	18.0	37.0	37.0	0.0

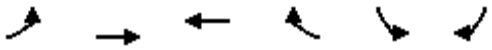
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (%)	54.2%	54.2%	0.0%	15.0%	69.2%	0.0%	30.8%	30.8%	15.0%	30.8%	30.8%	0.0%
Maximum Green (s)	60.0	60.0		13.0	78.0		32.0	32.0	13.0	32.0	32.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	-2.0	0.0	0.0	-2.0	0.0	-2.0	-2.0	-2.0	-2.0	-2.0	0.0
Total Lost Time (s)	5.0	3.0	4.0	5.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	4.0
Lead/Lag	Lag	Lag		Lead					Lead			
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max		None	C-Max		None	None	None	None	None	
Act Effct Green (s)	61.2	63.2		34.0	102.8		14.4	14.4	50.8	14.4	14.4	
Actuated g/C Ratio	0.51	0.53		0.28	0.86		0.12	0.12	0.42	0.12	0.12	
v/c Ratio	0.05	1.00		0.35	0.39		0.47	0.15	0.96	0.07	0.11	
Control Delay	11.7	25.5		37.5	5.6		57.7	47.0	60.7	45.4	46.2	
Queue Delay	0.0	0.0		0.0	0.1		0.0	0.0	0.0	0.0	0.0	
Total Delay	11.7	25.5		37.5	5.6		57.7	47.0	60.7	45.4	46.2	
LOS	B	C		D	A		E	D	E	D	D	
Approach Delay		25.4			12.9			59.8			46.0	
Approach LOS		C			B			E			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 93 (78%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.00			
Intersection Signal Delay: 27.0		Intersection LOS: C	
Intersection Capacity Utilization 99.0%		ICU Level of Service F	
Analysis Period (min) 15			

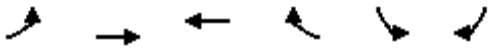
Splits and Phases: 15: SR 18 & Heritage Woods Dr.

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2360	20	10	1060	10	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	350		0	0
Storage Lanes		0	1		1	0
Taper Length (ft)		25	25		25	25
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.999				0.892	
Flt Protected			0.950		0.990	
Satd. Flow (prot)	3536	0	1770	3539	1645	0
Flt Permitted			0.950		0.990	
Satd. Flow (perm)	3536	0	1770	3539	1645	0
Link Speed (mph)	45			45	25	
Link Distance (ft)	951			491	519	
Travel Time (s)	14.4			7.4	14.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2622	22	11	1178	11	44
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2644	0	11	1178	55	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 75.9%		ICU Level of Service D	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	320	2600	1150	550	550	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	315			450	0	300
Storage Lanes	1			1	1	1
Taper Length (ft)	25			25	25	25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.97	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	5036	5036	1583	3433	1583
Flt Permitted	0.125				0.950	
Satd. Flow (perm)	233	5036	5036	1583	3433	1583
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		45	
Link Distance (ft)		684	666		2709	
Travel Time (s)		10.4	10.1		41.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	3%	3%	2%	2%	2%
Adj. Flow (vph)	356	2889	1278	611	611	222
Shared Lane Traffic (%)						
Lane Group Flow (vph)	356	2889	1278	611	611	222
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Right	Right
Median Width(ft)		12	12		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt			pm+ov		pm+ov
Protected Phases	5	2	6	4	4	5
Permitted Phases	2			6		4
Detector Phase	5	2	6	4	4	5
Switch Phase						
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	13.0	22.0	22.0	22.0	22.0	13.0
Total Split (s)	34.0	83.0	49.0	37.0	37.0	34.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (%)	28.3%	69.2%	40.8%	30.8%	30.8%	28.3%
Maximum Green (s)	30.0	78.0	44.0	32.0	32.0	30.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	1.0	1.0	1.0	1.0	0.0
Lost Time Adjust (s)	0.0	-2.0	-2.0	-2.0	-2.0	0.0
Total Lost Time (s)	4.0	3.0	3.0	3.0	3.0	4.0
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	None	None
Act Effct Green (s)	83.0	84.0	57.3	90.3	30.0	55.7
Actuated g/C Ratio	0.69	0.70	0.48	0.75	0.25	0.46
v/c Ratio	0.79	0.82	0.53	0.51	0.71	0.30
Control Delay	37.4	4.1	24.8	8.8	45.7	19.6
Queue Delay	0.0	0.4	0.0	0.0	0.0	0.0
Total Delay	37.4	4.4	24.8	8.8	45.7	19.6
LOS	D	A	C	A	D	B
Approach Delay		8.1	19.6		38.7	
Approach LOS		A	B		D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green, Master Intersection			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 16.0		Intersection LOS: B	
Intersection Capacity Utilization 72.6%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 25: SR 18 & Crystal Lake