APPENDIX A – HIGHWAY CAPACITY SOFTWARE (HCS) OUTPUT

HCS7: Two-Lane Highways Release 7.4

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Time Period	2018 Design Hour
Highway	KY 151
From/To	US 127 to KY 512
Jurisdiction	KYTC District 7
Analysis Year	2018
Description	KY 151 Segment #1

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	4.0	ft	% Trucks and buses	8	%
Lane width	11.0	ft	% Trucks crawling	0.0	%
Segment length	1.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	90	%
Up/down	-	%	Access point density	24	/mi

Analysis direction volume, Vd 443 veh/h
Opposing direction volume, Vo 377 veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.2	1.3
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor,(note-5) fHV	0.984	0.977
Grade adj. factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	489 pc/h	419 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	52.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.7	mi/h
Adj. for access point density,(note-3) fA	6.0	mi/h
Free-flow speed, FFSd	44.3	mi/h
Adjustment for no-passing zones, fnp	2.5	mi/h
Average travel speed, ATSd	34.7	mi/h
Percent Free Flow Speed, PFFS	78.4	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	482 pc/h	410 pc/h
Base percent time-spent-following,(note-4) BPTSFd	49.1 %	
Adjustment for no-passing zones, fnp	41.2	
Percent time-spent-following, PTSFd	71.4 %	

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.28	
Peak 15-min vehicle-miles of travel, VMT15	217	veh-mi
Peak-hour vehicle-miles of travel, VMT60	797	veh-mi
Peak 15-min total travel time, TT15	6.2	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	34.7	mi/h
Percent time-spent-following, PTSFd (from above)	71.4	
Level of service, LOSd (from above)	C	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	45
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	481.5
Effective width of outside lane, We	15.00
Effective speed factor, St	4.42
Bicycle LOS Score, BLOS	6.51
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS7: Two-Lane Highways Release 7.4

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Time Period	2018 Design Hour
Highway	KY 151
From/To	KY 512 to Franklin County Line
Jurisdiction	KYTC District 7
Analysis Year	2018
Description	KY 151 Segment #2

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.93	
Shoulder width	1.5	ft	% Trucks and buses	10	%
Lane width	11.0	ft	% Trucks crawling	0.0	%
Segment length	2.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	90	%
Up/down	-	%	Access point density	21	/mi

Analysis direction volume, Vd 257 veh/h
Opposing direction volume, Vo 186 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.4		1.5	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.962		0.952	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	287	pc/h	210	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.7	mi/h
Adj. for access point density,(note-3) fA	5.3	mi/h
Free-flow speed, FFSd	50.0	mi/h
Adjustment for no-passing zones, fnp	3.9	mi/h
Average travel speed, ATSd	42.3	mi/h
Percent Free Flow Speed, PFFS	84.5	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.990	0.990
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	279 pc/h	202 pc/h
Base percent time-spent-following,(note-4) BPTSFd	28.4 %	
Adjustment for no-passing zones, fnp	56.1	
Percent time-spent-following, PTSFd	60.9 %	

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.16	
Peak 15-min vehicle-miles of travel, VMT15	193	veh-mi
Peak-hour vehicle-miles of travel, VMT60	720	veh-mi
Peak 15-min total travel time, TT15	4.6	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	42.3	mi/h
Percent time-spent-following, PTSFd (from above)	60.9	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	276.3
Effective width of outside lane, We	12.50
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	7.59
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Time Period	2018 Design Hour
Highway	KY 151
From/To	Franklin County Line to I-64
Jurisdiction	KYTC District 5
Analysis Year	2018
Description	KY 151 Segment #3

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.93	
Shoulder width	5.0	ft	% Trucks and buses	11	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.1	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	90	%
Up/down	-	%	Access point density	12	/mi

Analysis direction volume, Vd	302	veh/h
Opposing direction volume, Vo	201	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	2.1		2.3	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.892		0.875	
Grade adj. factor,(note-1) fg	0.85		0.76	
Directional flow rate,(note-2) vi	428	pc/h	325	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	3.0	mi/h
Free-flow speed, FFSd	55.7	mi/h
Adjustment for no-passing zones, fnp	3.3	mi/h
Average travel speed, ATSd	46.6	mi/h
Percent Free Flow Speed, PFFS	83.6	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.6	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.938	0.929
Grade adjustment factor,(note-1) fg	0.86	0.81
Directional flow rate,(note-2) vi	403 pc/h	287 pc/h
Base percent time-spent-following,(note-4) BPTSFd	40.0 %	
Adjustment for no-passing zones, fnp	47.8	
Percent time-spent-following, PTSFd	67.9 %	

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.20	
Peak 15-min vehicle-miles of travel, VMT15	170	veh-mi
Peak-hour vehicle-miles of travel, VMT60	634	veh-mi
Peak 15-min total travel time, TT15	3.6	veh-h
Capacity from ATS, CdATS	1646	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1646	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.1	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.6	mi/h
Percent time-spent-following, PTSFd (from above)	67.9	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	324.7
Effective width of outside lane, We	22.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.45
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS7 Two-Way Stop-Control Report

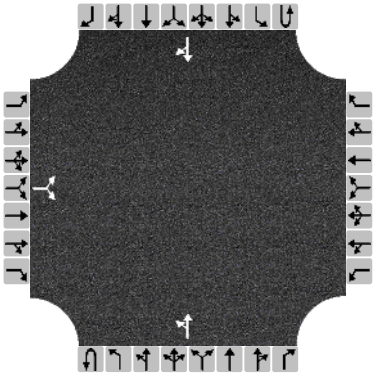
General Information

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Year	2018
Time Analyzed	2018 AM Design Hour
Intersection Orientation	North-South
Project Description	KY 151 Scoping Study

Site Information

Intersection	KY 151 @ Alton Station Rd
Jurisdiction	
East/West Street	Alton Station Rd.
North/South Street	KY 151
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		80		170						60	310				270	10
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			281							67						
Capacity, c (veh/h)			792							1238						
v/c Ratio			0.35							0.05						
95% Queue Length, Q_{95} (veh)			1.6							0.2						
Control Delay (s/veh)			12.0							8.1						
Level of Service, LOS			B							A						
Approach Delay (s/veh)		12.0								1.8						
Approach LOS		B														

HCS7 Two-Way Stop-Control Report

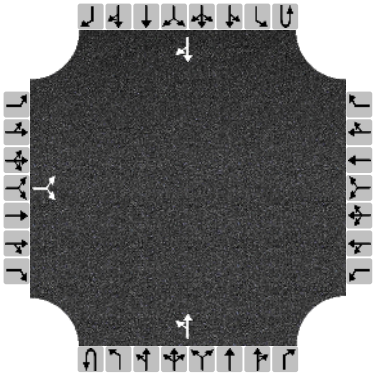
General Information

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Year	2018
Time Analyzed	2018 PM Design Hour
Intersection Orientation	North-South
Project Description	KY 151 Scoping Study

Site Information

Intersection	KY 151 @ Alton Station Rd
Jurisdiction	
East/West Street	Alton Station Rd.
North/South Street	KY 151
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		30		120						160	340				370	110
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			161							172						
Capacity, c (veh/h)			752							1044						
v/c Ratio			0.21							0.16						
95% Queue Length, Q_{95} (veh)			0.8							0.6						
Control Delay (s/veh)			11.1							9.1						
Level of Service, LOS			B							A						
Approach Delay (s/veh)		11.1								4.2						
Approach LOS		B														

HCS7 Two-Way Stop-Control Report

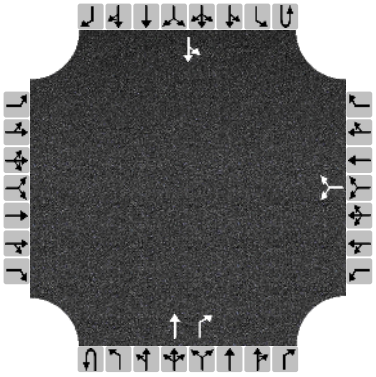
General Information

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Year	2018
Time Analyzed	2018 AM Design Hour
Intersection Orientation	North-South
Project Description	KY 151 Scoping Study

Site Information

Intersection	KY 151 @ Old Frankfort Rd
Jurisdiction	
East/West Street	Old Frankfort Rd.
North/South Street	KY 151
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	1	0	0	1	0
Configuration							LR				T	R		LT		
Volume, V (veh/h)						30		10			300	80		10	180	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				Yes				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							48							12		
Capacity, c (veh/h)							502							1195		
v/c Ratio							0.09							0.01		
95% Queue Length, Q_{95} (veh)							0.3							0.0		
Control Delay (s/veh)							12.9							8.0		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						12.9								0.5		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

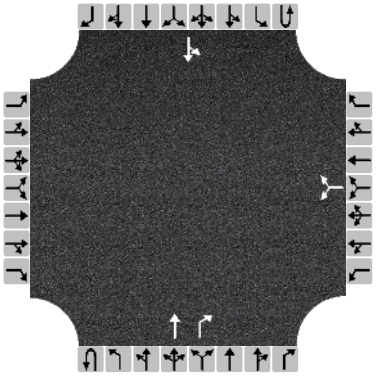
General Information

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Year	2018
Time Analyzed	2018 PM Design Hour
Intersection Orientation	North-South
Project Description	KY 151 Scoping Study

Site Information

Intersection	KY 151 @ Old Frankfort Rd
Jurisdiction	
East/West Street	Old Frankfort Rd.
North/South Street	KY 151
Peak Hour Factor	0.98
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	1	0	0	1	0
Configuration							LR				T	R		LT		
Volume, V (veh/h)						150		30			300	60		20	450	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				Yes				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

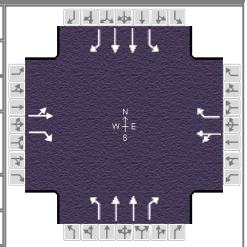
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							184							20		
Capacity, c (veh/h)							377							1248		
v/c Ratio							0.49							0.02		
95% Queue Length, Q_{95} (veh)							2.6							0.0		
Control Delay (s/veh)							23.3							7.9		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						23.3								0.5		
Approach LOS						C										

HCS7 Signalized Intersection Results Summary

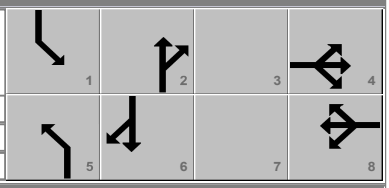
General Information				Intersection Information	
Agency	Stantec			Duration, h	0.25
Analyst	GW	Analysis Date	3/27/2018	Area Type	Other
Jurisdiction		Time Period	2018 AM Design Hour	PHF	0.89
Urban Street		Analysis Year	2018	Analysis Period	1> 7:00
Intersection	KY 151 @ US 127	File Name	Existing AM KY 151 @ US 127.xus		
Project Description	KY 151 Scoping Study				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	120	130	490	40	110	260	210	750	90	110	320	40

Signal Information			
Cycle, s	89.2	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	8.3	0.6	20.8	34.7	0.0	0.0
Yellow	3.5	3.5	5.0	5.0	0.0	0.0
Red	2.1	2.1	1.2	2.4	0.0	0.0



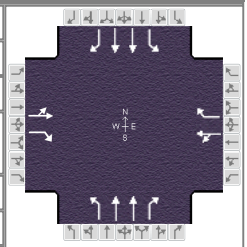
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		7.0		7.0	2.0	3.0	2.0	3.0
Phase Duration, s		42.1		42.1	20.2	33.2	13.9	27.0
Change Period, ($Y+R_c$), s		7.4		7.4	5.6	6.2	5.6	6.2
Max Allow Headway (*MAH*), s		6.2		6.2	3.9	3.4	3.9	3.4
Queue Clearance Time (g_s), s		33.3		14.7	14.1	22.6	8.4	10.2
Green Extension Time (g_e), s		1.3		11.1	0.5	4.4	0.3	4.4
Phase Call Probability		1.00		1.00	1.00	1.00	0.95	1.00
Max Out Probability		1.00		0.52	0.01	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		281	551		169	292	236	843	101	124	360	45
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1471	1510		1643	1547	1697	1696	1510	1682	1682	1497
Queue Service Time (g_s), s		6.9	31.3		0.0	12.7	12.1	20.6	4.5	6.4	8.2	2.1
Cycle Queue Clearance Time (g_c), s		12.5	31.3		5.6	12.7	12.1	20.6	4.5	6.4	8.2	2.1
Green Ratio (*g/C*)		0.39	0.39		0.39	0.39	0.16	0.30	0.30	0.09	0.23	0.23
Capacity (*c*), veh/h		631	587		690	601	277	1027	457	157	783	349
Volume-to-Capacity Ratio (*X*)		0.445	0.938		0.244	0.486	0.851	0.820	0.221	0.786	0.459	0.129
Back of Queue (*Q*), ft/ln (50 th percentile)		110.6	368.8		57.8	114.1	136.7	202.8	38.9	75.7	81.7	18.9
Back of Queue (*Q*), veh/ln (50 th percentile)		4.2	13.9		2.2	4.4	5.1	7.6	1.5	2.8	3.1	0.7
Queue Storage Ratio (*RQ*) (50 th percentile)		0.32	1.05		0.24	0.48	0.26	0.00	0.08	0.17	0.00	0.05
Uniform Delay (d_1), s/veh		20.4	26.3		18.4	20.6	36.3	28.9	23.3	39.6	29.4	27.1
Incremental Delay (d_2), s/veh		1.1	23.4		0.4	1.3	7.2	1.3	0.2	8.3	0.3	0.1
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		21.4	49.7		18.8	21.9	43.5	30.1	23.4	47.9	29.7	27.2
Level of Service (LOS)		C	D		B	C	D	C	C	D	C	C
Approach Delay, s/veh / LOS	40.1	D		20.7	C		32.2	C		33.8	C	
Intersection Delay, s/veh / LOS	32.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.42	B	2.42	B	1.92	B	1.93	B
Bicycle LOS Score / LOS	1.86	B	1.25	A	1.46	A	0.92	A

HCS7 Signalized Intersection Results Summary

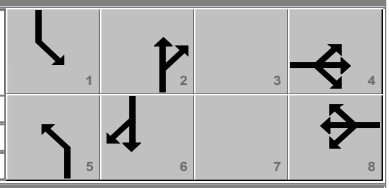
General Information				Intersection Information	
Agency	Stantec			Duration, h	0.25
Analyst	GW	Analysis Date	3/27/2018	Area Type	Other
Jurisdiction		Time Period	2018 PM Design Hour	PHF	0.98
Urban Street		Analysis Year	2018	Analysis Period	1> 4:00
Intersection	KY 151 @ US 127	File Name	Existing PM KY 151 @ US 127.xus		
Project Description	KY 151 Scoping Study				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	50	210	210	60	190	370	290	420	90	380	1130	50

Signal Information			
Cycle, s	125.2	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	23.7	0.7	42.1	33.9	0.0	0.0
Yellow	3.5	3.5	5.0	5.0	0.0	0.0
Red	2.1	2.1	1.2	2.4	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		7.0		7.0	2.0	3.0	2.0	3.0
Phase Duration, s		41.3		41.3	29.3	48.3	35.6	54.6
Change Period, ($Y+R_c$), s		7.4		7.4	5.6	6.2	5.6	6.2
Max Allow Headway (*MAH*), s		6.2		6.2	3.9	3.4	3.9	3.4
Queue Clearance Time (g_s), s		21.6		31.5	23.5	14.0	30.5	42.1
Green Extension Time (g_e), s		7.2		2.4	0.2	6.4	0.0	6.3
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.62		1.00	1.00	0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		265	214		255	378	296	429	92	388	1153	51
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1539	1510		1482	1547	1697	1696	1510	1682	1682	1497
Queue Service Time (g_s), s		0.0	15.1		0.5	29.5	21.5	12.0	5.4	28.5	40.1	2.7
Cycle Queue Clearance Time (g_c), s		19.6	15.1		20.3	29.5	21.5	12.0	5.4	28.5	40.1	2.7
Green Ratio (*g/C*)		0.27	0.27		0.27	0.27	0.19	0.34	0.34	0.24	0.39	0.39
Capacity (*c*), veh/h		451	409		437	419	321	1141	508	403	1301	579
Volume-to-Capacity Ratio (*X*)		0.588	0.524		0.583	0.900	0.923	0.376	0.181	0.962	0.886	0.088
Back of Queue (*Q*), ft/ln (50 th percentile)		196.3	151.6		185.9	350.9	300.3	125.1	50.1	408.2	418.8	24.7
Back of Queue (*Q*), veh/ln (50 th percentile)		7.4	5.7		7.1	13.5	11.3	4.7	1.9	15.2	15.6	0.9
Queue Storage Ratio (*RQ*) (50 th percentile)		0.56	0.43		0.77	1.46	0.57	0.00	0.10	0.94	0.00	0.06
Uniform Delay (d_1), s/veh		39.9	38.8		40.0	44.0	49.9	31.6	29.4	47.1	35.8	24.4
Incremental Delay (d_2), s/veh		3.0	2.3		3.0	22.4	29.3	0.2	0.1	35.1	2.3	0.0
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		42.9	41.1		43.0	66.4	79.2	31.7	29.5	82.1	38.1	24.4
Level of Service (LOS)		D	D		D	E	E	C	C	F	D	C
Approach Delay, s/veh / LOS	42.1	D		57.0	E		48.7	D		48.4	D	
Intersection Delay, s/veh / LOS	49.2						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.45	B	2.45	B	1.93	B	1.92	B
Bicycle LOS Score / LOS	1.28	A	1.53	B	1.16	A	1.80	B

HCS7: Two-Lane Highways Release 7.4

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Time Period	2040 Design Hour
Highway	KY 151
From/To	US 127 to KY 512
Jurisdiction	KYTC District 7
Analysis Year	2040
Description	KY 151 Segment #1

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.92	
Shoulder width	4.0	ft	% Trucks and buses	8	%
Lane width	11.0	ft	% Trucks crawling	0.0	%
Segment length	1.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	90	%
Up/down	-	%	Access point density	24	/mi

Analysis direction volume, Vd 548 veh/h
Opposing direction volume, Vo 467 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.2	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.992		0.984	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	600	pc/h	516	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	52.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.7	mi/h
Adj. for access point density,(note-3) fA	6.0	mi/h
Free-flow speed, FFSd	44.3	mi/h
Adjustment for no-passing zones, fnp	2.1	mi/h
Average travel speed, ATSd	33.5	mi/h
Percent Free Flow Speed, PFFS	75.7	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	596 pc/h	508 pc/h
Base percent time-spent-following,(note-4) BPTSFd	57.2 %	
Adjustment for no-passing zones, fnp	35.5	
Percent time-spent-following, PTSFd	76.4 %	

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.35	
Peak 15-min vehicle-miles of travel, VMT15	268	veh-mi
Peak-hour vehicle-miles of travel, VMT60	986	veh-mi
Peak 15-min total travel time, TT15	8.0	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	33.5	mi/h
Percent time-spent-following, PTSFd (from above)	76.4	
Level of service, LOSd (from above)	C	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	595.7
Effective width of outside lane, We	15.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.88
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Time Period	2040 Design Hour
Highway	KY 151
From/To	KY 512 to Franklin County Line
Jurisdiction	KYTC District 7
Analysis Year	2040
Description	KY 151 Segment #2

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.93	
Shoulder width	1.5	ft	% Trucks and buses	10	%
Lane width	11.0	ft	% Trucks crawling	0.0	%
Segment length	2.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	90	%
Up/down	-	%	Access point density	15	/mi

Analysis direction volume, Vd	324	veh/h
Opposing direction volume, Vo	234	veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.4		1.4	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.962		0.962	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	362	pc/h	262	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.7	mi/h
Adj. for access point density,(note-3) fA	3.8	mi/h
Free-flow speed, FFSd	51.5	mi/h
Adjustment for no-passing zones, fnp	3.6	mi/h
Average travel speed, ATSd	43.1	mi/h
Percent Free Flow Speed, PFFS	83.7	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.990	0.990
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	352 pc/h	254 pc/h
Base percent time-spent-following,(note-4) BPTSFd	35.9 %	
Adjustment for no-passing zones, fnp	53.8	
Percent time-spent-following, PTSFd	67.2 %	

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.20	
Peak 15-min vehicle-miles of travel, VMT15	244	veh-mi
Peak-hour vehicle-miles of travel, VMT60	907	veh-mi
Peak 15-min total travel time, TT15	5.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	43.1	mi/h
Percent time-spent-following, PTSFd (from above)	67.2	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	348.4
Effective width of outside lane, We	12.50
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	7.71
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS7: Two-Lane Highways Release 7.4

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Time Period	2040 Design Hour
Highway	KY 151
From/To	Franklin County Line to I-64
Jurisdiction	KYTC District 5
Analysis Year	2040
Description	KY 151 Segment #3

Input Data

Highway class	Class 3		Peak hour factor, PHF	0.93	
Shoulder width	5.0	ft	% Trucks and buses	11	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.1	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Rolling		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	90	%
Up/down	-	%	Access point density	12	/mi

Analysis direction volume, Vd 372 veh/h
Opposing direction volume, Vo 248 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	2.0		2.2	
PCE for RVs, ER	1.1		1.1	
Heavy-vehicle adj. factor,(note-5) fHV	0.901		0.883	
Grade adj. factor,(note-1) fg	0.90		0.80	
Directional flow rate,(note-2) vi	493	pc/h	378	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	1.3	mi/h
Adj. for access point density,(note-3) fA	3.0	mi/h
Free-flow speed, FFSd	55.7	mi/h
Adjustment for no-passing zones, fnp	3.0	mi/h
Average travel speed, ATSd	46.0	mi/h
Percent Free Flow Speed, PFFS	82.6	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.6	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.938	0.929
Grade adjustment factor,(note-1) fg	0.90	0.83
Directional flow rate,(note-2) vi	474 pc/h	346 pc/h
Base percent time-spent-following,(note-4) BPTSFd	47.2 %	
Adjustment for no-passing zones, fnp	40.1	
Percent time-spent-following, PTSFd	70.4 %	

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.24	
Peak 15-min vehicle-miles of travel, VMT15	210	veh-mi
Peak-hour vehicle-miles of travel, VMT60	781	veh-mi
Peak 15-min total travel time, TT15	4.6	veh-h
Capacity from ATS, CdATS	1646	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1646	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.1	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.0	mi/h
Percent time-spent-following, PTSFd (from above)	70.4	
Level of service, LOSd (from above)	C	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	E	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	400.0
Effective width of outside lane, We	22.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.56
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS7 Two-Way Stop-Control Report

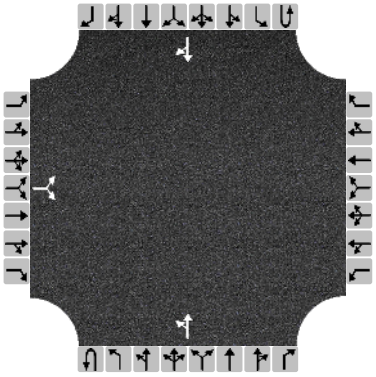
General Information

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Year	2040
Time Analyzed	2040 AM Design Hour
Intersection Orientation	North-South
Project Description	KY 151 Scoping Study

Site Information

Intersection	KY 151 @ Alton Station Rd
Jurisdiction	
East/West Street	Alton Station Rd.
North/South Street	KY 151
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		100		210						80	380				330	20
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			348							90						
Capacity, c (veh/h)			606							1159						
v/c Ratio			0.57							0.08						
95% Queue Length, Q_{95} (veh)			3.6							0.3						
Control Delay (s/veh)			18.6							8.4						
Level of Service, LOS			C							A						
Approach Delay (s/veh)		18.6								2.2						
Approach LOS		C														

HCS7 Two-Way Stop-Control Report

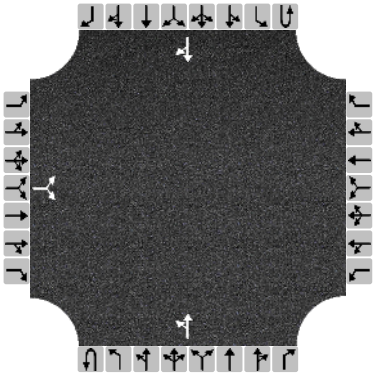
General Information

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Year	2040
Time Analyzed	2040 PM Design Hour
Intersection Orientation	North-South
Project Description	KY 151 Scoping Study

Site Information

Intersection	KY 151 @ Alton Station Rd
Jurisdiction	
East/West Street	Alton Station Rd.
North/South Street	KY 151
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		40		160						210	410				420	130
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			215							226						
Capacity, c (veh/h)			448							979						
v/c Ratio			0.48							0.23						
95% Queue Length, Q_{95} (veh)			2.5							0.9						
Control Delay (s/veh)			20.2							9.8						
Level of Service, LOS			C							A						
Approach Delay (s/veh)	20.2								5.3							
Approach LOS	C															

HCS7 Two-Way Stop-Control Report

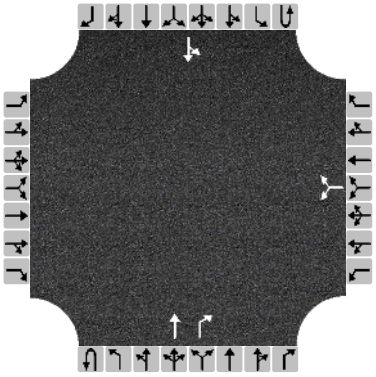
General Information

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Year	2040
Time Analyzed	2040 AM Design Hour
Intersection Orientation	North-South
Project Description	KY 151 Scoping Study

Site Information

Intersection	KY 151 @ Old Frankfort Rd
Jurisdiction	
East/West Street	Old Frankfort Rd.
North/South Street	KY 151
Peak Hour Factor	0.84
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	1	0	0	1	0
Configuration							LR				T	R		LT		
Volume, V (veh/h)						40		20			370	100		20	220	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				Yes				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							71							24		
Capacity, c (veh/h)							426							1113		
v/c Ratio							0.17							0.02		
95% Queue Length, Q_{95} (veh)							0.6							0.1		
Control Delay (s/veh)							15.1							8.3		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						15.1								0.9		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

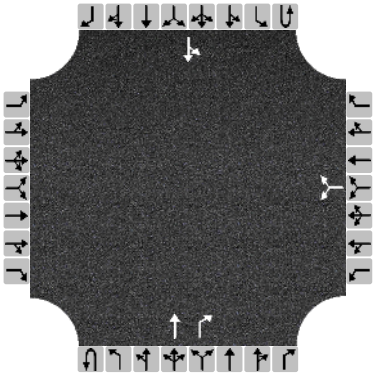
General Information

Analyst	GW
Agency/Co.	Stantec
Date Performed	3/27/2018
Analysis Year	2040
Time Analyzed	2040 PM Design Hour
Intersection Orientation	North-South
Project Description	KY 151 Scoping Study

Site Information

Intersection	KY 151 @ Old Frankfort Rd
Jurisdiction	
East/West Street	Old Frankfort Rd.
North/South Street	KY 151
Peak Hour Factor	0.98
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	1	0	0	1	0
Configuration							LR				T	R		LT		
Volume, V (veh/h)						120		20			240	50		10	360	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				Yes				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

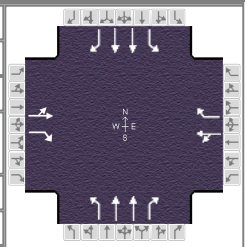
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							143							10		
Capacity, c (veh/h)							468							1314		
v/c Ratio							0.31							0.01		
95% Queue Length, Q_{95} (veh)							1.3							0.0		
Control Delay (s/veh)							16.0							7.8		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						16.0								0.3		
Approach LOS						C										

HCS7 Signalized Intersection Results Summary

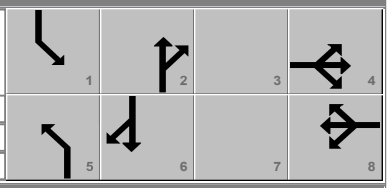
General Information				Intersection Information	
Agency	Stantec			Duration, h	0.25
Analyst	GW	Analysis Date	3/27/2018	Area Type	Other
Jurisdiction		Time Period	2040 AM Design Hour	PHF	0.89
Urban Street		Analysis Year	2040	Analysis Period	1> 7:00
Intersection	KY 151 @ US 127	File Name	2040 AM KY 151 @ US 127.xus		
Project Description	KY 151 Scoping Study				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	160	160	620	60	140	320	270	930	120	140	400	50

Signal Information			
Cycle, s	103.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	11.7	3.2	28.7	35.0	0.0	0.0	
Yellow	3.5	3.5	5.0	5.0	0.0	0.0	
Red	2.1	2.1	1.2	2.4	0.0	0.0	



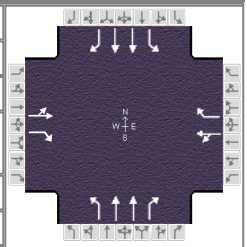
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		7.0		7.0	2.0	3.0	2.0	3.0
Phase Duration, s		42.4		42.4	26.1	43.6	17.3	34.9
Change Period, ($Y+R_c$), s		7.4		7.4	5.6	6.2	5.6	6.2
Max Allow Headway (*MAH*), s		6.2		6.2	3.9	3.4	3.9	3.4
Queue Clearance Time (g_s), s		37.0		22.7	20.0	31.4	11.5	13.5
Green Extension Time (g_e), s		0.0		9.5	0.4	6.1	0.4	6.1
Phase Call Probability		1.00		1.00	1.00	1.00	0.99	1.00
Max Out Probability		1.00		0.86	0.55	0.00	0.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		360	697		225	360	303	1045	135	157	449	56
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1310	1510		1504	1547	1697	1696	1510	1682	1682	1497
Queue Service Time (g_s), s		15.4	35.0		0.0	20.7	18.0	29.4	6.5	9.5	11.5	2.9
Cycle Queue Clearance Time (g_c), s		26.8	35.0		11.3	20.7	18.0	29.4	6.5	9.5	11.5	2.9
Green Ratio (*g/C*)		0.34	0.34		0.34	0.34	0.20	0.36	0.36	0.11	0.28	0.28
Capacity (*c*), veh/h		496	511		554	524	337	1228	547	191	933	415
Volume-to-Capacity Ratio (*X*)		0.725	1.363		0.405	0.686	0.901	0.851	0.247	0.823	0.482	0.135
Back of Queue (*Q*), ft/ln (50 th percentile)		229.1	980.6		108.6	206.2	236.5	293.5	57.1	111.9	117.6	26.6
Back of Queue (*Q*), veh/ln (50 th percentile)		8.6	36.9		4.2	7.9	8.9	11.0	2.1	4.2	4.4	1.0
Queue Storage Ratio (*RQ*) (50 th percentile)		0.65	2.80		0.45	0.86	0.45	0.00	0.11	0.26	0.00	0.06
Uniform Delay (d_1), s/veh		32.2	34.2		26.1	29.5	40.4	30.4	23.1	44.8	31.2	28.0
Incremental Delay (d_2), s/veh		6.4	175.7		1.0	4.8	19.9	1.3	0.2	8.6	0.3	0.1
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		38.6	209.9		27.1	34.3	60.4	31.7	23.3	53.4	31.4	28.2
Level of Service (LOS)		D	F		C	C	E	C	C	D	C	C
Approach Delay, s/veh / LOS	151.6	F		31.5	C		36.8	D		36.4	D	
Intersection Delay, s/veh / LOS	67.9						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.44	B	2.44	B	1.92	B	1.93	B
Bicycle LOS Score / LOS	2.23	B	1.45	A	1.71	B	1.03	A

HCS7 Signalized Intersection Results Summary

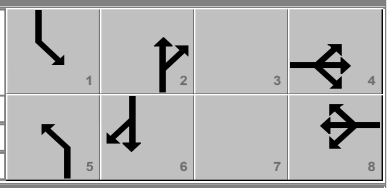
General Information				Intersection Information	
Agency	Stantec			Duration, h	0.25
Analyst	GW	Analysis Date	3/27/2018	Area Type	Other
Jurisdiction		Time Period	2040 PM Design Hour	PHF	0.98
Urban Street		Analysis Year	2040	Analysis Period	1> 4:00
Intersection	KY 151 @ US 127	File Name	2040 PM KY 151 @ US 127.xus		
Project Description	KY 151 Scoping Study				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	60	250	250	80	230	460	330	530	110	470	1400	80

Signal Information			
Cycle, s	147.3	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	25.0	5.0		63.1	35.0	0.0	0.0					
Yellow	3.5	0.0		5.0	5.0	0.0	0.0					
Red	2.1	0.0		1.2	2.4	0.0	0.0					



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		7.0		7.0	2.0	3.0	2.0	3.0
Phase Duration, s		42.4		42.4	30.6	69.3	35.6	74.3
Change Period, ($Y+R_c$), s		7.4		7.4	5.6	6.2	5.6	6.2
Max Allow Headway (*MAH*), s		6.2		6.2	3.9	3.4	3.9	3.4
Queue Clearance Time (g_s), s		37.0		37.0	27.0	18.0	32.0	60.5
Green Extension Time (g_e), s		0.0		0.0	0.0	9.4	0.0	7.7
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		1.00	1.00	0.00	1.00	0.19

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		316	255		316	469	337	541	112	480	1429	82
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1264	1510		1024	1547	1697	1696	1510	1682	1682	1497
Queue Service Time (g_s), s		0.0	22.8		0.0	35.0	25.0	16.0	6.8	30.0	58.5	4.6
Cycle Queue Clearance Time (g_c), s		35.0	22.8		35.0	35.0	25.0	16.0	6.8	30.0	58.5	4.6
Green Ratio (*g/C*)		0.24	0.24		0.24	0.24	0.17	0.43	0.43	0.20	0.46	0.46
Capacity (*c*), veh/h		329	359		274	368	288	1454	647	343	1556	692
Volume-to-Capacity Ratio (*X*)		0.961	0.711		1.154	1.277	1.170	0.372	0.173	1.400	0.918	0.118
Back of Queue (*Q*), ft/ln (50 th percentile)		405.9	247		469.1	729.3	504.2	166.5	63	831.4	639.5	41.9
Back of Queue (*Q*), veh/ln (50 th percentile)		15.3	9.3		18.0	28.1	19.0	6.3	2.4	31.0	23.9	1.6
Queue Storage Ratio (*RQ*) (50 th percentile)		1.16	0.71		1.95	3.04	0.95	0.00	0.12	1.91	0.00	0.10
Uniform Delay (d_1), s/veh		56.2	51.5		57.3	56.2	61.2	28.6	26.0	58.7	37.0	22.5
Incremental Delay (d_2), s/veh		39.5	8.0		102.6	144.2	107.1	0.1	0.1	196.8	6.9	0.1
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		95.7	59.6		159.9	200.4	168.3	28.7	26.1	255.5	43.9	22.6
Level of Service (LOS)		F	E		F	F	F	C	C	F	D	C
Approach Delay, s/veh / LOS	79.6	E		184.1	F		75.9	E		94.1	F	
Intersection Delay, s/veh / LOS	104.3						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.46	B	2.46	B	1.93	B	1.92	B
Bicycle LOS Score / LOS	1.43	A	1.78	B	1.30	A	2.13	B