

















# Appendix

# **Appendix A: US 401 & Ten-Ten Road Level of Service Analysis**

# Michigan Lefts Option



















HCM Unsignalized Intersection Capacity Analysis  
 301: Gelder Drive & US 401 SB Lanes

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	31	9	11	0	0	0	0	0	863	26
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	34	10	12	0	0	0	0	0	959	29
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											1236	
pX, platoon unblocked	0.97	0.97	0.97	0.97	0.97		0.97					
vC, conflicting volume	965	959	479	514	988	0	988			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	893	887	391	426	917	0	917			0		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	94	98	95	100	100			100		
cM capacity (veh/h)	220	272	587	466	261	1084	714			1622		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>SB 1</b>	<b>SB 2</b>	<b>SB 3</b>							
Volume Total	34	22	479	479	29							
Volume Left	0	10	0	0	0							
Volume Right	34	0	0	0	29							
cSH	587	326	1700	1700	1700							
Volume to Capacity	0.06	0.07	0.28	0.28	0.02							
Queue Length 95th (ft)	5	5	0	0	0							
Control Delay (s)	11.5	16.9	0.0	0.0	0.0							
Lane LOS	B	C										
Approach Delay (s)	11.5	16.9	0.0									
Approach LOS	B	C										
<b>Intersection Summary</b>												
Average Delay			0.7									
Intersection Capacity Utilization			40.5%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 301: Gelder Drive & US 401 SB Lanes

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											  	
Volume (veh/h)	0	0	41	12	15	0	0	0	0	0	1163	35
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	46	13	17	0	0	0	0	0	1292	39
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											1239	
pX, platoon unblocked												
vC, conflicting volume	1301	1292	431	476	1331	0	1331			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1301	1292	431	476	1331	0	1331			0		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	92	97	89	100	100			100		
cM capacity (veh/h)	109	162	573	434	153	1084	514			1622		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>SB 1</b>	<b>SB 2</b>	<b>SB 3</b>	<b>SB 4</b>						
Volume Total	46	30	431	431	431	39						
Volume Left	0	13	0	0	0	0						
Volume Right	46	0	0	0	0	39						
cSH	573	215	1700	1700	1700	1700						
Volume to Capacity	0.08	0.14	0.25	0.25	0.25	0.02						
Queue Length 95th (ft)	6	12	0	0	0	0						
Control Delay (s)	11.8	24.4	0.0	0.0	0.0	0.0						
Lane LOS	B	C										
Approach Delay (s)	11.8	24.4	0.0									
Approach LOS	B	C										
<b>Intersection Summary</b>												
Average Delay			0.9									
Intersection Capacity Utilization			39.1%		ICU Level of Service					A		
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 301: Gelder Drive & US 401 SB Lanes

7/5/2013






















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗		↖						↕	↗
Volume (veh/h)	0	0	55	4	10	0	0	0	0	0	1809	22
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	61	4	11	0	0	0	0	0	2010	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											1220	
pX, platoon unblocked	0.43	0.43	0.43	0.43	0.43		0.43					
vC, conflicting volume	2016	2010	1005	1066	2034	0	2034			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	694	681	0	0	738	0	738			0		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	87	99	92	100	100			100		
cM capacity (veh/h)	132	158	463	379	147	1084	369			1622		

Direction, Lane #	EB 1	WB 1	SB 1	SB 2	SB 3
Volume Total	61	16	1005	1005	24
Volume Left	0	4	0	0	0
Volume Right	61	0	0	0	24
cSH	463	178	1700	1700	1700
Volume to Capacity	0.13	0.09	0.59	0.59	0.01
Queue Length 95th (ft)	11	7	0	0	0
Control Delay (s)	14.0	27.2	0.0	0.0	0.0
Lane LOS	B	D			
Approach Delay (s)	14.0	27.2	0.0		
Approach LOS	B	D			

Intersection Summary		
Average Delay		0.6
Intersection Capacity Utilization	66.7%	ICU Level of Service C
Analysis Period (min)		15

HCM Unsignalized Intersection Capacity Analysis  
301: Gelder Drive & US 401

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											   	
Volume (veh/h)	0	0	75	5	13	0	0	0	0	0	2410	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	83	6	14	0	0	0	0	0	2678	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											1246	
pX, platoon unblocked	0.47	0.47	0.47	0.47	0.47		0.47					
vC, conflicting volume	2685	2678	893	976	2711	0	2711			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	649	634	0	0	704	0	704			0		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	84	99	91	100	100			100		
cM capacity (veh/h)	156	186	511	403	170	1084	419			1622		
Direction, Lane #	EB 1	WB 1	SB 1	SB 2	SB 3	SB 4						
Volume Total	83	20	893	893	893	33						
Volume Left	0	6	0	0	0	0						
Volume Right	83	0	0	0	0	33						
cSH	511	202	1700	1700	1700	1700						
Volume to Capacity	0.16	0.10	0.53	0.53	0.53	0.02						
Queue Length 95th (ft)	14	8	0	0	0	0						
Control Delay (s)	13.4	24.8	0.0	0.0	0.0	0.0						
Lane LOS	B	C										
Approach Delay (s)	13.4	24.8	0.0									
Approach LOS	B	C										
Intersection Summary												
Average Delay			0.6									
Intersection Capacity Utilization			64.5%		ICU Level of Service					C		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis  
 304: Shopping Center Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↰	↱				↰		↕	↰				
Volume (vph)	480	17	0	0	0	11	0	1861	15	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0				5.0		5.0	5.0				
Lane Util. Factor	0.95	0.95				1.00		0.95	1.00				
Frt	1.00	1.00				0.86		1.00	0.85				
Flt Protected	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (prot)	1681	1691				1611		3539	1583				
Flt Permitted	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (perm)	1681	1691				1611		3539	1583				
Peak-hour factor, 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	
Adj. Flow (vph)	533	19	0	0	0	12	0	2068	17	0	0	0	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	277	275	0	0	0	12	0	2068	17	0	0	0	
Turn Type	Perm		custom					Perm					
Protected Phases	4							2					
Permitted Phases	4							8					
Actuated Green, G (s)	23.2	23.2						23.2	82.8	82.8			
Effective Green, g (s)	25.2	25.2						25.2	84.8	84.8			
Actuated g/C Ratio	0.21	0.21						0.21	0.71	0.71			
Clearance Time (s)	7.0	7.0						7.0	7.0	7.0			
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0			
Lane Grp Cap (vph)	353	355						338	2501	1119			
v/s Ratio Prot								c0.58					
v/s Ratio Perm	c0.16	0.16						0.01			0.01		
v/c Ratio	0.78	0.77						0.04	0.83	0.02			
Uniform Delay, d1	44.8	44.7						37.7	12.4	5.2			
Progression Factor	0.88	0.88						1.00	1.00	1.00			
Incremental Delay, d2	9.5	8.8						0.0	3.3	0.0			
Delay (s)	48.8	48.0						37.8	15.7	5.2			
Level of Service	D	D						D	B	A			
Approach Delay (s)	48.4		37.8					15.6		0.0			
Approach LOS	D		D					B		A			

Intersection Summary

HCM Average Control Delay	22.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



HCM Signalized Intersection Capacity Analysis  
 304: Shopping Center Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↖	↗				↖		↑↑↑	↖				
Volume (vph)	646	23	0	0	0	15	0	2506	20	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0				5.0		5.0	5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91	1.00				
Frt	1.00	1.00				0.86		1.00	0.85				
Flt Protected	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (prot)	1681	1691				1611		5085	1583				
Flt Permitted	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (perm)	1681	1691				1611		5085	1583				
Peak-hour factor, 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	
Adj. Flow (vph)	718	26	0	0	0	17	0	2784	22	0	0	0	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	373	371	0	0	0	17	0	2784	22	0	0	0	
Turn Type	Perm		custom					Perm					
Protected Phases	4							2					
Permitted Phases	4							8					
Actuated Green, G (s)	29.9	29.9						29.9	76.1	76.1			
Effective Green, g (s)	31.9	31.9						31.9	78.1	78.1			
Actuated g/C Ratio	0.27	0.27						0.27	0.65	0.65			
Clearance Time (s)	7.0	7.0						7.0	7.0	7.0			
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0			
Lane Grp Cap (vph)	447	450						428	3309	1030			
v/s Ratio Prot								c0.55					
v/s Ratio Perm	c0.22	0.22						0.01		0.01			
v/c Ratio	0.83	0.82						0.04	0.84	0.02			
Uniform Delay, d1	41.6	41.4						32.7	16.2	7.4			
Progression Factor	0.97	0.97						1.00	1.00	1.00			
Incremental Delay, d2	10.9	10.0						0.0	2.8	0.0			
Delay (s)	51.2	50.2						32.7	18.9	7.5			
Level of Service	D	D						C	B	A			
Approach Delay (s)	50.7		32.7					18.9		0.0			
Approach LOS	D		C					B		A			

Intersection Summary

HCM Average Control Delay	25.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 304: Shopping Center Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↶	↷				↶		↶↶	↶				
Volume (vph)	601	71	0	0	0	61	0	1320	17	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0				5.0		5.0	5.0				
Lane Util. Factor	0.95	0.95				1.00		0.95	1.00				
Frt	1.00	1.00				0.86		1.00	0.85				
Flt Protected	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (prot)	1681	1703				1611		3539	1583				
Flt Permitted	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (perm)	1681	1703				1611		3539	1583				
Peak-hour factor, 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	
Adj. Flow (vph)	668	79	0	0	0	68	0	1467	19	0	0	0	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	374	373	0	0	0	68	0	1467	19	0	0	0	
Turn Type	Perm		custom					Perm					
Protected Phases	4							2					
Permitted Phases	4							8					
Actuated Green, G (s)	32.9	32.9						32.9	73.1	73.1			
Effective Green, g (s)	34.9	34.9						34.9	75.1	75.1			
Actuated g/C Ratio	0.29	0.29						0.29	0.63	0.63			
Clearance Time (s)	7.0	7.0						7.0	7.0	7.0			
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0			
Lane Grp Cap (vph)	489	495						469	2215	991			
v/s Ratio Prot								c0.41					
v/s Ratio Perm	c0.22	0.22						0.04		0.01			
v/c Ratio	0.76	0.75						0.14	0.66	0.02			
Uniform Delay, d1	38.8	38.6						31.5	14.3	8.5			
Progression Factor	0.83	0.83						1.00	1.00	1.00			
Incremental Delay, d2	0.7	0.6						0.1	1.6	0.0			
Delay (s)	33.0	32.8						31.6	15.9	8.5			
Level of Service	C	C						C	B	A			
Approach Delay (s)	32.9		31.6					15.8					0.0
Approach LOS	C		C					B					A

Intersection Summary			
HCM Average Control Delay	21.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		
c	Critical Lane Group		

HCM Signalized Intersection Capacity Analysis  
 304: Shopping Center Access & US 401

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↘	↙				↗		↑↑↑	↗				
Volume (vph)	815	96	0	0	0	83	0	1733	23	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0				5.0		5.0	5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91	1.00				
Frt	1.00	1.00				0.86		1.00	0.85				
Flt Protected	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (prot)	1681	1702				1611		5085	1583				
Flt Permitted	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (perm)	1681	1702				1611		5085	1583				
Peak-hour factor, 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	
Adj. Flow (vph)	906	107	0	0	0	92	0	1926	26	0	0	0	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	507	506	0	0	0	92	0	1926	26	0	0	0	
Turn Type	Perm		custom					Perm					
Protected Phases	4							2					
Permitted Phases	4							8					
Actuated Green, G (s)	43.1	43.1						43.1	62.9	62.9			
Effective Green, g (s)	45.1	45.1						45.1	64.9	64.9			
Actuated g/C Ratio	0.38	0.38						0.38	0.54	0.54			
Clearance Time (s)	7.0	7.0						7.0	7.0	7.0			
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0			
Lane Grp Cap (vph)	632	640						605	2750	856			
v/s Ratio Prot								c0.38					
v/s Ratio Perm	c0.30	0.30						0.06		0.02			
v/c Ratio	0.80	0.79						0.15	0.70	0.03			
Uniform Delay, d1	33.5	33.3						24.8	20.4	12.9			
Progression Factor	0.86	0.86						1.00	1.00	1.00			
Incremental Delay, d2	2.0	1.8						0.1	1.5	0.1			
Delay (s)	30.8	30.4						24.9	21.9	12.9			
Level of Service	C	C						C	C	B			
Approach Delay (s)	30.6		24.9					21.8					0.0
Approach LOS	C		C					C					A

Intersection Summary

HCM Average Control Delay	24.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	94.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 401: Ten Ten Road & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑↑		↑↑						↑↑	↑
Volume (vph)	0	221	411	0	535	0	0	0	0	0	975	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0						5.0	5.0
Lane Util. Factor		0.95	0.88		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3539	2787		3539						3539	1583
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3539	2787		3539						3539	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	246	457	0	594	0	0	0	0	0	1083	160
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	246	457	0	594	0	0	0	0	0	1083	160
Turn Type		custom										Perm
Protected Phases		4	4		8	3					6	
Permitted Phases			3									6
Actuated Green, G (s)		24.2	30.6		33.4						73.4	73.4
Effective Green, g (s)		26.2	34.6		37.4						75.4	75.4
Actuated g/C Ratio		0.22	0.29		0.31						0.63	0.63
Clearance Time (s)		7.0	7.0								7.0	7.0
Vehicle Extension (s)		3.0	3.0								3.0	3.0
Lane Grp Cap (vph)		773	920		1103						2224	995
v/s Ratio Prot		0.07	c0.11		c0.17						c0.31	
v/s Ratio Perm			0.06									0.10
v/c Ratio		0.32	0.50		0.54						0.49	0.16
Uniform Delay, d1		39.4	35.5		34.2						11.9	9.2
Progression Factor		1.00	1.00		0.01						0.72	0.77
Incremental Delay, d2		0.2	0.4		0.4						0.7	0.3
Delay (s)		39.6	35.9		0.8						9.4	7.4
Level of Service		D	D		A						A	A
Approach Delay (s)		37.2			0.8			0.0			9.1	
Approach LOS		D			A			A			A	

### Intersection Summary

HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 401: Ten Ten Road & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑↑		↑↑						↑↑↑	↑
Volume (vph)	0	298	553	0	721	0	0	0	0	0	1314	194
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0						5.0	5.0
Lane Util. Factor		0.95	0.88		0.95						0.91	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3539	2787		3539						5085	1583
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3539	2787		3539						5085	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	331	614	0	801	0	0	0	0	0	1460	216
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	331	614	0	801	0	0	0	0	0	1460	216
Turn Type		custom										Perm
Protected Phases		4	4		8	3					6	
Permitted Phases			3									6
Actuated Green, G (s)		25.5	29.0		29.5						74.0	74.0
Effective Green, g (s)		27.5	33.0		33.5						76.0	76.0
Actuated g/C Ratio		0.23	0.28		0.28						0.63	0.63
Clearance Time (s)		7.0	7.0								7.0	7.0
Vehicle Extension (s)		3.0	3.0								3.0	3.0
Lane Grp Cap (vph)		811	883		988						3221	1003
v/s Ratio Prot		0.09	c0.16		c0.23						c0.29	
v/s Ratio Perm			0.06									0.14
v/c Ratio		0.41	0.70		0.81						0.45	0.22
Uniform Delay, d1		39.3	39.0		40.3						11.3	9.3
Progression Factor		1.00	1.00		0.04						0.74	0.77
Incremental Delay, d2		0.3	2.4		1.5						0.4	0.5
Delay (s)		39.7	41.4		3.3						8.8	7.7
Level of Service		D	D		A						A	A
Approach Delay (s)		40.8			3.3			0.0			8.7	
Approach LOS		D			A			A			A	

### Intersection Summary

HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 401: Ten Ten Road & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑↑		↑↑						↑↑	↑
Volume (vph)	0	609	337	0	364	0	0	0	0	0	2167	438
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0						5.0	5.0
Lane Util. Factor		0.95	0.88		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3539	2787		3539						3539	1583
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3539	2787		3539						3539	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	677	374	0	404	0	0	0	0	0	2408	487
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	677	374	0	404	0	0	0	0	0	2408	487
Turn Type		custom										Perm
Protected Phases		4	4		8	3					6	
Permitted Phases			3									6
Actuated Green, G (s)		27.6	31.0		25.9						73.0	73.0
Effective Green, g (s)		29.6	35.0		29.9						75.0	75.0
Actuated g/C Ratio		0.25	0.29		0.25						0.62	0.62
Clearance Time (s)		7.0	7.0								7.0	7.0
Vehicle Extension (s)		3.0	3.0								3.0	3.0
Lane Grp Cap (vph)		873	929		882						2212	989
v/s Ratio Prot		c0.19	c0.10		0.11						c0.68	
v/s Ratio Perm			0.03									0.31
v/c Ratio		0.78	0.40		0.46						1.09	0.49
Uniform Delay, d1		42.1	34.1		38.2						22.5	12.2
Progression Factor		1.00	1.00		0.03						0.82	0.82
Incremental Delay, d2		4.4	0.3		0.3						43.7	0.7
Delay (s)		46.5	34.4		1.3						62.1	10.8
Level of Service		D	C		A						E	B
Approach Delay (s)		42.2			1.3			0.0			53.5	
Approach LOS		D			A			A			D	

### Intersection Summary

HCM Average Control Delay	45.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 401: Ten Ten Road & US 401

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑↑		↑↑						↑↑↑	↑
Volume (vph)	0	820	454	0	490	0	0	0	0	0	2911	590
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0						5.0	5.0
Lane Util. Factor		0.95	0.88		0.95						0.91	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3539	2787		3539						5085	1583
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3539	2787		3539						5085	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	911	504	0	544	0	0	0	0	0	3234	656
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	911	504	0	544	0	0	0	0	0	3234	656
Turn Type		custom										Perm
Protected Phases		4	4		8	3					6	
Permitted Phases			3									6
Actuated Green, G (s)		29.0	32.0		30.7						71.0	71.0
Effective Green, g (s)		31.0	36.0		34.7						73.0	73.0
Actuated g/C Ratio		0.26	0.30		0.29						0.61	0.61
Clearance Time (s)		7.0	7.0								7.0	7.0
Vehicle Extension (s)		3.0	3.0								3.0	3.0
Lane Grp Cap (vph)		914	952		1023						3093	963
v/s Ratio Prot		c0.26	c0.14		0.15						c0.64	
v/s Ratio Perm			0.04									0.41
v/c Ratio		1.00	0.53		0.53						1.05	0.68
Uniform Delay, d1		44.4	35.0		35.8						23.5	15.7
Progression Factor		1.00	1.00		0.00						0.77	0.66
Incremental Delay, d2		28.8	0.5		0.4						24.3	1.3
Delay (s)		73.2	35.5		0.5						42.3	11.8
Level of Service		E	D		A						D	B
Approach Delay (s)		59.8			0.5			0.0			37.2	
Approach LOS		E			A			A			D	

### Intersection Summary

HCM Average Control Delay	39.2	HCM Level of Service	D
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 402: Ten Ten Road & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↑↑		↑↑	↑			
Volume (vph)	0	221	0	0	535	438	0	2101	251	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0	5.0			
Lane Util. Factor		0.95			0.95	0.88		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3539			3539	2787		3539	1583			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3539			3539	2787		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	246	0	0	594	487	0	2334	279	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	246	0	0	594	487	0	2334	279	0	0	0
Turn Type					custom				Perm			
Protected Phases		4 7			8	8		2				
Permitted Phases						7			2			
Actuated Green, G (s)		27.8			27.0	30.6		73.4	73.4			
Effective Green, g (s)		31.8			29.0	34.6		75.4	75.4			
Actuated g/C Ratio		0.27			0.24	0.29		0.63	0.63			
Clearance Time (s)					7.0	7.0		7.0	7.0			
Vehicle Extension (s)					3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		938			855	920		2224	995			
v/s Ratio Prot		0.07			c0.17	c0.13		c0.66				
v/s Ratio Perm						0.05			0.18			
v/c Ratio		0.26			0.69	0.53		1.05	0.28			
Uniform Delay, d1		34.8			41.5	35.9		22.3	10.1			
Progression Factor		0.03			1.00	1.00		0.80	0.86			
Incremental Delay, d2		0.1			2.5	0.6		29.7	0.4			
Delay (s)		1.1			43.9	36.4		47.5	9.0			
Level of Service		A			D	D		D	A			
Approach Delay (s)		1.1			40.5			43.4			0.0	
Approach LOS		A			D			D			A	

### Intersection Summary

HCM Average Control Delay	40.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



HCM Signalized Intersection Capacity Analysis  
 402: Ten Ten Road & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↑↑		↑↑↑	↑			
Volume (vph)	0	298	0	0	721	590	0	2829	338	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0	5.0			
Lane Util. Factor		0.95			0.95	0.88		0.91	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3539			3539	2787		5085	1583			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3539			3539	2787		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	331	0	0	801	656	0	3143	376	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	331	0	0	801	656	0	3143	376	0	0	0
Turn Type					custom			Perm				
Protected Phases		4 7			8	8		2				
Permitted Phases						7			2			
Actuated Green, G (s)		28.5			26.0	29.0		74.0	74.0			
Effective Green, g (s)		32.5			28.0	33.0		76.0	76.0			
Actuated g/C Ratio		0.27			0.23	0.28		0.63	0.63			
Clearance Time (s)					7.0	7.0		7.0	7.0			
Vehicle Extension (s)					3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		958			826	883		3221	1003			
v/s Ratio Prot		0.09			c0.23	c0.17		c0.62				
v/s Ratio Perm						0.06			0.24			
v/c Ratio		0.35			0.97	0.74		0.98	0.37			
Uniform Delay, d1		35.2			45.6	39.6		21.1	10.6			
Progression Factor		0.00			1.00	1.00		0.66	0.81			
Incremental Delay, d2		0.2			23.8	3.4		7.3	0.6			
Delay (s)		0.2			69.4	43.0		21.3	9.1			
Level of Service		A			E	D		C	A			
Approach Delay (s)		0.2			57.5			20.0			0.0	
Approach LOS		A			E			B			A	

**Intersection Summary**

HCM Average Control Delay	29.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 402: Ten Ten Road & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↑↑		↑↑	↑			
Volume (vph)	0	609	0	0	364	321	0	1443	540	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0	5.0			
Lane Util. Factor		0.95			0.95	0.88		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3539			3539	2787		3539	1583			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3539			3539	2787		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	677	0	0	404	357	0	1603	600	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	677	0	0	404	357	0	1603	600	0	0	0
Turn Type					custom			Perm				
Protected Phases		4 7			8	8		2				
Permitted Phases						7			2			
Actuated Green, G (s)		36.1			22.5	31.0		73.0	73.0			
Effective Green, g (s)		40.0			24.5	35.0		75.0	75.0			
Actuated g/C Ratio		0.33			0.20	0.29		0.62	0.62			
Clearance Time (s)					7.0	7.0		7.0	7.0			
Vehicle Extension (s)					3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)	1180				723	929		2212	989			
v/s Ratio Prot		c0.19			0.11	0.08		c0.45				
v/s Ratio Perm						0.05			0.38			
v/c Ratio		0.57			0.56	0.38		0.72	0.61			
Uniform Delay, d1		33.0			42.9	33.9		15.4	13.6			
Progression Factor		0.01			1.00	1.00		0.90	0.85			
Incremental Delay, d2		0.4			0.9	0.3		1.6	2.1			
Delay (s)		0.9			43.8	34.2		15.5	13.7			
Level of Service		A			D	C		B	B			
Approach Delay (s)		0.9			39.3			15.0			0.0	
Approach LOS		A			D			B			A	













### Intersection Summary

HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 402: Ten Ten Road & US 401

7/5/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑			↑↑	↑↑		↑↑↑	↑				
Volume (vph)	0	820	0	0	490	432	0	1918	727	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		5.0			5.0	5.0		5.0	5.0				
Lane Util. Factor		0.95			0.95	0.88		0.91	1.00				
Frt		1.00			1.00	0.85		1.00	0.85				
Flt Protected		1.00			1.00	1.00		1.00	1.00				
Satd. Flow (prot)		3539			3539	2787		5085	1583				
Flt Permitted		1.00			1.00	1.00		1.00	1.00				
Satd. Flow (perm)		3539			3539	2787		5085	1583				
Peak-hour factor, 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	
Adj. Flow (vph)	0	911	0	0	544	480	0	2131	808	0	0	0	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	0	911	0	0	544	480	0	2131	808	0	0	0	
Turn Type					custom				Perm				
Protected Phases		4 7			8	8		2					
Permitted Phases						7			2				
Actuated Green, G (s)		33.3			27.7	32.0		71.0	71.0				
Effective Green, g (s)		37.3			29.7	36.0		73.0	73.0				
Actuated g/C Ratio		0.31			0.25	0.30		0.61	0.61				
Clearance Time (s)					7.0	7.0		7.0	7.0				
Vehicle Extension (s)					3.0	3.0		3.0	3.0				
Lane Grp Cap (vph)		1100			876	952		3093	963				
v/s Ratio Prot		c0.26			0.15	c0.12		0.42					
v/s Ratio Perm						0.05			c0.51				
v/c Ratio		0.83			0.62	0.50		0.69	0.84				
Uniform Delay, d1		38.4			40.1	34.6		15.8	18.8				
Progression Factor		0.06			1.00	1.00		0.79	0.82				
Incremental Delay, d2		1.3			1.4	0.4		0.9	6.5				
Delay (s)		3.4			41.5	35.1		13.4	21.9				
Level of Service		A			D	D		B	C				
Approach Delay (s)		3.4			38.5			15.8			0.0		
Approach LOS		A			D			B			A		
<b>Intersection Summary</b>													
HCM Average Control Delay			18.2		HCM Level of Service				B				
HCM Volume to Capacity ratio			0.83										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)				10.0				
Intersection Capacity Utilization			87.2%		ICU Level of Service				E				
Analysis Period (min)			15										
c	Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 501: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↕↕
Volume (vph)	235	0	0	0	0	889
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	261	0	0	0	0	988
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	261	0	0	0	0	988
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	14.5					91.5
Effective Green, g (s)	16.5					93.5
Actuated g/C Ratio	0.14					0.78
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	472					2757
v/s Ratio Prot	c0.08					c0.28
v/s Ratio Perm						
v/c Ratio	0.55					0.36
Uniform Delay, d1	48.3					4.1
Progression Factor	1.14					1.00
Incremental Delay, d2	0.4					0.4
Delay (s)	55.4					4.4
Level of Service	E					A
Approach Delay (s)	55.4		0.0			4.4
Approach LOS	E		A			A

### Intersection Summary

HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	95.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 501: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↑↑↑
Volume (vph)	316	0	0	0	0	1271
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	351	0	0	0	0	1412
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	351	0	0	0	0	1412
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	17.6					88.4
Effective Green, g (s)	19.6					90.4
Actuated g/C Ratio	0.16					0.75
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	561					3831
v/s Ratio Prot	c0.10					c0.28
v/s Ratio Perm						
v/c Ratio	0.63					0.37
Uniform Delay, d1	46.8					5.1
Progression Factor	1.10					1.00
Incremental Delay, d2	0.7					0.3
Delay (s)	52.2					5.3
Level of Service	D					A
Approach Delay (s)	52.2		0.0			5.3
Approach LOS	D		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			14.7		HCM Level of Service	B
HCM Volume to Capacity ratio			0.41			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			92.1%		ICU Level of Service	F
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM Signalized Intersection Capacity Analysis

## 501: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↕↕
Volume (vph)	579	0	0	0	0	2029
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	643	0	0	0	0	2254
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	643	0	0	0	0	2254
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	23.6					82.4
Effective Green, g (s)	25.6					84.4
Actuated g/C Ratio	0.21					0.70
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	732					2489
v/s Ratio Prot	c0.19					c0.64
v/s Ratio Perm						
v/c Ratio	0.88					0.91
Uniform Delay, d1	45.7					14.5
Progression Factor	0.97					1.00
Incremental Delay, d2	8.8					6.1
Delay (s)	53.3					20.6
Level of Service	D					C
Approach Delay (s)	53.3		0.0			20.6
Approach LOS	D		A			C
<b>Intersection Summary</b>						
HCM Average Control Delay			27.9		HCM Level of Service	C
HCM Volume to Capacity ratio			0.90			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			96.4%		ICU Level of Service	F
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM Signalized Intersection Capacity Analysis

## 501: North Median Break & US 401

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	←←					→→→
Volume (vph)	795	0	0	0	0	2788
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	883	0	0	0	0	3098
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	883	0	0	0	0	3098
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	29.0					77.0
Effective Green, g (s)	31.0					79.0
Actuated g/C Ratio	0.26					0.66
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	887					3348
v/s Ratio Prot	c0.26					c0.61
v/s Ratio Perm						
v/c Ratio	1.00					0.93
Uniform Delay, d1	44.4					17.9
Progression Factor	1.00					1.00
Incremental Delay, d2	24.7					5.7
Delay (s)	69.1					23.6
Level of Service	E					C
Approach Delay (s)	69.1		0.0			23.6
Approach LOS	E		A			C
<b>Intersection Summary</b>						
HCM Average Control Delay			33.7		HCM Level of Service	C
HCM Volume to Capacity ratio			0.95			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			91.4%		ICU Level of Service	F
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM Signalized Intersection Capacity Analysis

## 504: Autozone / Smithfields Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↕↕	↗			
Volume (vph)	0	47	0	0	0	32	0	2305	4	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		1.00				1.00		0.95	1.00			
Frt		1.00				0.86		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		1863				1611		3539	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		1863				1611		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	52	0	0	0	36	0	2561	4	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	52	0	0	0	36	0	2561	4	0	0	0
Turn Type	Perm					custom				Perm		
Protected Phases		4						2				
Permitted Phases	4					8			2			
Actuated Green, G (s)		7.6				7.6		98.4	98.4			
Effective Green, g (s)		9.6				9.6		100.4	100.4			
Actuated g/C Ratio		0.08				0.08		0.84	0.84			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		149				129		2961	1324			
v/s Ratio Prot		c0.03						c0.72				
v/s Ratio Perm						0.02			0.00			
v/c Ratio		0.35				0.28		0.86	0.00			
Uniform Delay, d1		52.2				51.9		5.8	1.6			
Progression Factor		1.00				1.00		0.41	0.50			
Incremental Delay, d2		1.4				1.2		1.0	0.0			
Delay (s)		53.7				53.1		3.4	0.8			
Level of Service		D				D		A	A			
Approach Delay (s)		53.7			53.1			3.4			0.0	
Approach LOS		D			D			A			A	

### Intersection Summary

HCM Average Control Delay	5.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	103.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



HCM Signalized Intersection Capacity Analysis  
 504: Autozone / Smithfields Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↑↑↑	↗			
Volume (vph)	0	63	0	0	0	43	0	3104	5	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		1.00				1.00		0.91	1.00			
Frt		1.00				0.86		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		1863				1611		5085	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		1863				1611		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	70	0	0	0	48	0	3449	6	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	70	0	0	0	48	0	3449	6	0	0	0
Turn Type	Perm					custom				Perm		
Protected Phases		4						2				
Permitted Phases	4					8			2			
Actuated Green, G (s)		8.5				8.5		97.5	97.5			
Effective Green, g (s)		10.5				10.5		99.5	99.5			
Actuated g/C Ratio		0.09				0.09		0.83	0.83			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		163				141		4216	1313			
v/s Ratio Prot		c0.04						c0.68				
v/s Ratio Perm						0.03			0.00			
v/c Ratio		0.43				0.34		0.82	0.00			
Uniform Delay, d1		51.9				51.5		5.4	1.8			
Progression Factor		1.00				1.00		0.23	0.41			
Incremental Delay, d2		1.8				1.4		0.6	0.0			
Delay (s)		53.7				52.9		1.9	0.7			
Level of Service		D				D		A	A			
Approach Delay (s)		53.7			52.9			1.9			0.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	3.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	99.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 504: Autozone / Smithfields Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↕↕	↗			
Volume (vph)	0	76	0	0	0	47	0	1175	14	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		1.00				1.00		0.95	1.00			
Frt		1.00				0.86		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		1863				1611		3539	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		1863				1611		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	84	0	0	0	52	0	1306	16	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	84	0	0	0	52	0	1306	16	0	0	0
Turn Type	Perm					custom				Perm		
Protected Phases		4						2				
Permitted Phases	4					8			2			
Actuated Green, G (s)		9.4				9.4		96.6	96.6			
Effective Green, g (s)		11.4				11.4		98.6	98.6			
Actuated g/C Ratio		0.10				0.10		0.82	0.82			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		177				153		2908	1301			
v/s Ratio Prot		c0.05						c0.37				
v/s Ratio Perm						0.03			0.01			
v/c Ratio		0.47				0.34		0.45	0.01			
Uniform Delay, d1		51.5				50.8		3.0	1.9			
Progression Factor		1.00				1.00		0.19	0.21			
Incremental Delay, d2		2.0				1.3		0.4	0.0			
Delay (s)		53.5				52.1		0.9	0.4			
Level of Service		D				D		A	A			
Approach Delay (s)		53.5			52.1			0.9			0.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	5.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	103.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 504: Autozone / Smithfields Access & US 401

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕				↗		↑↑↑	↗			
Volume (vph)	0	103	0	0	0	63	0	1537	18	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		1.00				1.00		0.91	1.00			
Frt		1.00				0.86		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		1863				1611		5085	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		1863				1611		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	114	0	0	0	70	0	1708	20	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	114	0	0	0	70	0	1708	20	0	0	0
Turn Type	Perm					custom				Perm		
Protected Phases		4						2				
Permitted Phases	4					8			2			
Actuated Green, G (s)		12.7				12.7		93.3	93.3			
Effective Green, g (s)		14.7				14.7		95.3	95.3			
Actuated g/C Ratio		0.12				0.12		0.79	0.79			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		228				197		4038	1257			
v/s Ratio Prot		c0.06						c0.34				
v/s Ratio Perm						0.04			0.01			
v/c Ratio		0.50				0.36		0.42	0.02			
Uniform Delay, d1		49.2				48.3		3.8	2.6			
Progression Factor		1.00				1.00		0.30	0.35			
Incremental Delay, d2		1.7				1.1		0.2	0.0			
Delay (s)		50.9				49.4		1.4	0.9			
Level of Service		D				D		A	A			
Approach Delay (s)		50.9			49.4			1.4			0.0	
Approach LOS		D			D			A			A	

Intersection Summary

HCM Average Control Delay	6.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	98.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Unsignalized Intersection Capacity Analysis

## 601: Ten Ten Road & Harris Teeter Access

7/5/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	↑
Volume (veh/h)	457	14	49	946	27	16
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	508	16	54	1051	30	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	617					
pX, platoon unblocked			0.96		0.96	0.96
vC, conflicting volume			523		1142	254
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			418		1063	137
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		85	98
cM capacity (veh/h)			1091		199	850

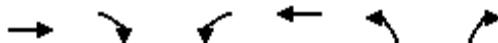
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	
Volume Total	254	254	16	54	526	526	30	18	
Volume Left	0	0	0	54	0	0	30	0	
Volume Right	0	0	16	0	0	0	0	18	
cSH	1700	1700	1700	1091	1700	1700	199	850	
Volume to Capacity	0.15	0.15	0.01	0.05	0.31	0.31	0.15	0.02	
Queue Length 95th (ft)	0	0	0	4	0	0	13	2	
Control Delay (s)	0.0	0.0	0.0	8.5	0.0	0.0	26.3	9.3	
Lane LOS				A				D	A
Approach Delay (s)	0.0			0.4			20.0		
Approach LOS							C		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		

# HCM Unsignalized Intersection Capacity Analysis

## 601: Ten Ten Road & Harris Teeter Access

7/5/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↵	↑↑	↵	↵
Volume (veh/h)	618	18	66	1274	36	22
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	687	20	73	1416	40	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	618					
pX, platoon unblocked			0.94		0.94	0.94
vC, conflicting volume			707		1541	343
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			548		1440	159
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		63	97
cM capacity (veh/h)			952		107	802

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	
Volume Total	343	343	20	73	708	708	40	24	
Volume Left	0	0	0	73	0	0	40	0	
Volume Right	0	0	20	0	0	0	0	24	
cSH	1700	1700	1700	952	1700	1700	107	802	
Volume to Capacity	0.20	0.20	0.01	0.08	0.42	0.42	0.37	0.03	
Queue Length 95th (ft)	0	0	0	6	0	0	38	2	
Control Delay (s)	0.0	0.0	0.0	9.1	0.0	0.0	57.7	9.6	
Lane LOS				A				F	A
Approach Delay (s)	0.0			0.4			39.5		
Approach LOS							E		

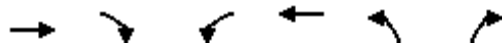
### Intersection Summary

Average Delay	1.4	
Intersection Capacity Utilization	45.2%	ICU Level of Service
Analysis Period (min)	15	
A		

# HCM Unsignalized Intersection Capacity Analysis

## 601: Ten Ten Road & Harris Teeter Access

7/5/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑
Volume (veh/h)	1147	2	69	652	33	107
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1274	2	77	724	37	119
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	610					
pX, platoon unblocked				0.84	0.84	0.84
vC, conflicting volume	1277			1790	637	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	959			1567	202	
tC, single (s)	4.1			6.8	6.9	
tC, 2 stage (s)						
tF (s)	2.2			3.5	3.3	
p0 queue free %	87			51	83	
cM capacity (veh/h)	602			75	680	

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	
Volume Total	637	637	2	77	362	362	37	119	
Volume Left	0	0	0	77	0	0	37	0	
Volume Right	0	0	2	0	0	0	0	119	
cSH	1700	1700	1700	602	1700	1700	75	680	
Volume to Capacity	0.37	0.37	0.00	0.13	0.21	0.21	0.49	0.17	
Queue Length 95th (ft)	0	0	0	11	0	0	50	16	
Control Delay (s)	0.0	0.0	0.0	11.9	0.0	0.0	92.2	11.4	
Lane LOS				B				F	B
Approach Delay (s)	0.0			1.1			30.5		
Approach LOS							D		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		

# HCM Unsignalized Intersection Capacity Analysis

## 601: Ten Ten Road & Harris Teeter Access

7/5/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	↑
Volume (veh/h)	1544	3	93	877	45	144
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1716	3	103	974	50	160
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	627					
pX, platoon unblocked			0.76		0.76	0.76
vC, conflicting volume			1719		2409	858
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1314		2223	181
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			74		0	75
cM capacity (veh/h)			397		21	631

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	
Volume Total	858	858	3	103	487	487	50	160	
Volume Left	0	0	0	103	0	0	50	0	
Volume Right	0	0	3	0	0	0	0	160	
cSH	1700	1700	1700	397	1700	1700	21	631	
Volume to Capacity	0.50	0.50	0.00	0.26	0.29	0.29	2.42	0.25	
Queue Length 95th (ft)	0	0	0	26	0	0	163	25	
Control Delay (s)	0.0	0.0	0.0	17.2	0.0	0.0	1039.7	12.6	
Lane LOS				C				F	B
Approach Delay (s)	0.0			1.7			257.2		
Approach LOS							F		

Intersection Summary			
Average Delay	18.6		
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		

















# Michigan Lefts with Single Quadrant Loop Option



# HCM Unsignalized Intersection Capacity Analysis



















## 301: Gelder Drive & US 401 SB Lanes

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	31	9	11	0	0	0	0	0	858	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	34	10	12	0	0	0	0	0	953	28
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											1264	
pX, platoon unblocked	0.96	0.96	0.96	0.96	0.96		0.96					
vC, conflicting volume	959	953	477	511	981	0	981			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	864	858	359	395	887	0	887			0		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	94	98	95	100	100			100		
cM capacity (veh/h)	229	280	609	486	269	1084	725			1622		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>SB 1</b>	<b>SB 2</b>	<b>SB 3</b>							
Volume Total	34	22	477	477	28							
Volume Left	0	10	0	0	0							
Volume Right	34	0	0	0	28							
cSH	609	337	1700	1700	1700							
Volume to Capacity	0.06	0.07	0.28	0.28	0.02							
Queue Length 95th (ft)	4	5	0	0	0							
Control Delay (s)	11.3	16.4	0.0	0.0	0.0							
Lane LOS	B	C										
Approach Delay (s)	11.3	16.4	0.0									
Approach LOS	B	C										
<b>Intersection Summary</b>												
Average Delay			0.7									
Intersection Capacity Utilization			40.4%		ICU Level of Service					A		
Analysis Period (min)			15									

















HCM Unsignalized Intersection Capacity Analysis  
 301: Gelder Drive & US 401 SB Lanes

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											  	
Volume (veh/h)	0	0	41	12	15	0	0	0	0	0	1156	33
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	46	13	17	0	0	0	0	0	1284	37
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											1271	
pX, platoon unblocked	0.99	0.99	0.99	0.99	0.99		0.99					
vC, conflicting volume	1293	1284	428	474	1321	0	1321			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1250	1242	374	421	1279	0	1279			0		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	93	97	90	100	100			100		
cM capacity (veh/h)	117	171	615	472	163	1084	531			1622		
Direction, Lane #	EB 1	WB 1	SB 1	SB 2	SB 3	SB 4						
Volume Total	46	30	428	428	428	37						
Volume Left	0	13	0	0	0	0						
Volume Right	46	0	0	0	0	37						
cSH	615	229	1700	1700	1700	1700						
Volume to Capacity	0.07	0.13	0.25	0.25	0.25	0.02						
Queue Length 95th (ft)	6	11	0	0	0	0						
Control Delay (s)	11.3	23.0	0.0	0.0	0.0	0.0						
Lane LOS	B	C										
Approach Delay (s)	11.3	23.0	0.0									
Approach LOS	B	C										
Intersection Summary												
Average Delay			0.9									
Intersection Capacity Utilization			39.0%	ICU Level of Service	A							
Analysis Period (min)			15									



















HCM Unsignalized Intersection Capacity Analysis  
301: Gelder Drive & US 401

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	55	4	10	0	0	0	0	0	1755	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	61	4	11	0	0	0	0	0	1950	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											1270	
pX, platoon unblocked	0.53	0.53	0.53	0.53	0.53		0.53					
vC, conflicting volume	1956	1950	975	1036	1972	0	1972			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1047	1037	0	0	1079	0	1079			0		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	89	99	90	100	100			100		
cM capacity (veh/h)	90	123	580	489	116	1084	344			1622		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>SB 1</b>	<b>SB 2</b>	<b>SB 3</b>							
Volume Total	61	16	975	975	22							
Volume Left	0	4	0	0	0							
Volume Right	61	0	0	0	22							
cSH	580	148	1700	1700	1700							
Volume to Capacity	0.11	0.10	0.57	0.57	0.01							
Queue Length 95th (ft)	9	9	0	0	0							
Control Delay (s)	11.9	32.1	0.0	0.0	0.0							
Lane LOS	B	D										
Approach Delay (s)	11.9	32.1	0.0									
Approach LOS	B	D										
<b>Intersection Summary</b>												
Average Delay			0.6									
Intersection Capacity Utilization			65.3%		ICU Level of Service					C		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 301: Gelder Drive & US 401 SB Lanes

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											  	
Volume (veh/h)	0	0	75	5	13	0	0	0	0	0	2364	27
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	83	6	14	0	0	0	0	0	2627	30
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)											1271	
pX, platoon unblocked	0.54	0.54	0.54	0.54	0.54		0.54					
vC, conflicting volume	2634	2627	876	959	2657	0	2657			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1045	1032	0	0	1087	0	1087			0		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	86	99	88	100	100			100		
cM capacity (veh/h)	89	125	586	474	116	1084	344			1622		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>SB 1</b>	<b>SB 2</b>	<b>SB 3</b>	<b>SB 4</b>						
Volume Total	83	20	876	876	876	30						
Volume Left	0	6	0	0	0	0						
Volume Right	83	0	0	0	0	30						
cSH	586	147	1700	1700	1700	1700						
Volume to Capacity	0.14	0.14	0.52	0.52	0.52	0.02						
Queue Length 95th (ft)	12	12	0	0	0	0						
Control Delay (s)	12.2	33.4	0.0	0.0	0.0	0.0						
Lane LOS	B	D										
Approach Delay (s)	12.2	33.4	0.0									
Approach LOS	B	D										
<b>Intersection Summary</b>												
Average Delay			0.6									
Intersection Capacity Utilization			63.7%		ICU Level of Service					B		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis  
 304: Shopping Center Access & US 401 NB Lanes

7/5/2013



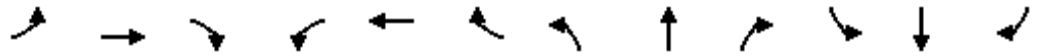
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	311	17	0	0	0	11	0	1842	15	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0				5.0		5.0	5.0				
Lane Util. Factor	0.95	0.95				1.00		0.95	1.00				
Frt	1.00	1.00				0.86		1.00	0.85				
Flt Protected	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (prot)	1681	1694				1611		3539	1583				
Flt Permitted	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (perm)	1681	1694				1611		3539	1583				
Peak-hour factor, 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	
Adj. Flow (vph)	346	19	0	0	0	12	0	2047	17	0	0	0	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	183	182	0	0	0	12	0	2047	17	0	0	0	
Turn Type	Perm		custom					Perm					
Protected Phases	4							2					
Permitted Phases	4							2					
Actuated Green, G (s)	17.1	17.1						17.1	88.9	88.9			
Effective Green, g (s)	19.1	19.1						19.1	90.9	90.9			
Actuated g/C Ratio	0.16	0.16						0.16	0.76	0.76			
Clearance Time (s)	7.0	7.0						7.0	7.0	7.0			
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0			
Lane Grp Cap (vph)	268	270						256	2681	1199			
v/s Ratio Prot								c0.58					
v/s Ratio Perm	c0.11	0.11						0.01			0.01		
v/c Ratio	0.68	0.67						0.05	0.76	0.01			
Uniform Delay, d1	47.6	47.5						42.7	8.4	3.6			
Progression Factor	0.84	0.84						1.00	1.00	1.00			
Incremental Delay, d2	6.4	5.9						0.1	2.1	0.0			
Delay (s)	46.3	45.8						42.8	10.5	3.6			
Level of Service	D	D						D	B	A			
Approach Delay (s)	46.1		42.8					10.4		0.0			
Approach LOS	D		D					B		A			

Intersection Summary

HCM Average Control Delay	15.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	89.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 304: Shopping Center Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	419	23	0	0	0	15	0	2481	20	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0				5.0		5.0	5.0				
Lane Util. Factor	0.95	0.95				1.00		0.91	1.00				
Frt	1.00	1.00				0.86		1.00	0.85				
Flt Protected	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (prot)	1681	1694				1611		5085	1583				
Flt Permitted	0.95	0.96				1.00		1.00	1.00				
Satd. Flow (perm)	1681	1694				1611		5085	1583				
Peak-hour factor, 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	
Adj. Flow (vph)	466	26	0	0	0	17	0	2757	22	0	0	0	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	247	245	0	0	0	17	0	2757	22	0	0	0	
Turn Type	Perm		custom					Perm					
Protected Phases	4							2					
Permitted Phases	4							8					
Actuated Green, G (s)	22.1	22.1						22.1	83.9	83.9			
Effective Green, g (s)	24.1	24.1						24.1	85.9	85.9			
Actuated g/C Ratio	0.20	0.20						0.20	0.72	0.72			
Clearance Time (s)	7.0	7.0						7.0	7.0	7.0			
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0			
Lane Grp Cap (vph)	338	340						324	3640	1133			
v/s Ratio Prot								c0.54					
v/s Ratio Perm	c0.15	0.14						0.01		0.01			
v/c Ratio	0.73	0.72						0.05	0.76	0.02			
Uniform Delay, d1	44.9	44.8						38.7	10.6	4.9			
Progression Factor	0.92	0.92						1.00	1.00	1.00			
Incremental Delay, d2	6.9	6.4						0.1	1.5	0.0			
Delay (s)	48.1	47.6						38.8	12.1	4.9			
Level of Service	D	D						D	B	A			
Approach Delay (s)	47.8		38.8					12.0					0.0
Approach LOS	D		D					B					A

Intersection Summary

HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 304: Shopping Center Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	212	71	0	0	0	61	0	1286	17	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0				5.0		5.0	5.0				
Lane Util. Factor	0.95	0.95				1.00		0.95	1.00				
Frt	1.00	1.00				0.86		1.00	0.85				
Flt Protected	0.95	0.98				1.00		1.00	1.00				
Satd. Flow (prot)	1681	1726				1611		3539	1583				
Flt Permitted	0.95	0.98				1.00		1.00	1.00				
Satd. Flow (perm)	1681	1726				1611		3539	1583				
Peak-hour factor, 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	
Adj. Flow (vph)	236	79	0	0	0	68	0	1429	19	0	0	0	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	156	159	0	0	0	68	0	1429	19	0	0	0	
Turn Type	Perm		custom					Perm					
Protected Phases	4							2					
Permitted Phases	4							8					
Actuated Green, G (s)	16.5	16.5						16.5	89.5	89.5			
Effective Green, g (s)	18.5	18.5						18.5	91.5	91.5			
Actuated g/C Ratio	0.15	0.15						0.15	0.76	0.76			
Clearance Time (s)	7.0	7.0						7.0	7.0	7.0			
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0			
Lane Grp Cap (vph)	259	266						248	2698	1207			
v/s Ratio Prot								c0.40					
v/s Ratio Perm	c0.09	0.09						0.04		0.01			
v/c Ratio	0.60	0.60						0.27	0.53	0.02			
Uniform Delay, d1	47.3	47.3						44.8	5.7	3.4			
Progression Factor	0.89	0.89						1.00	1.00	1.00			
Incremental Delay, d2	2.2	2.0						0.6	0.7	0.0			
Delay (s)	44.4	44.1						45.4	6.4	3.4			
Level of Service	D	D						D	A	A			
Approach Delay (s)	44.2		45.4					6.4					0.0
Approach LOS	D		D					A					A

Intersection Summary

HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	98.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 304: Shopping Center Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱				↰		↑↑↑	↰			
Volume (vph)	285	96	0	0	0	83	0	1776	23	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				5.0		5.0	5.0			
Lane Util. Factor	0.95	0.95				1.00		0.91	1.00			
Frt	1.00	1.00				0.86		1.00	0.85			
Flt Protected	0.95	0.98				1.00		1.00	1.00			
Satd. Flow (prot)	1681	1726				1611		5085	1583			
Flt Permitted	0.95	0.98				1.00		1.00	1.00			
Satd. Flow (perm)	1681	1726				1611		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	317	107	0	0	0	92	0	1973	26	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	209	215	0	0	0	92	0	1973	26	0	0	0
Turn Type	Perm		custom					Perm				
Protected Phases	4							2				
Permitted Phases	4							8				
Actuated Green, G (s)	20.6	20.6						20.6	85.4	85.4		
Effective Green, g (s)	22.6	22.6						22.6	87.4	87.4		
Actuated g/C Ratio	0.19	0.19						0.19	0.73	0.73		
Clearance Time (s)	7.0	7.0						7.0	7.0	7.0		
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0		
Lane Grp Cap (vph)	317	325						303	3704	1153		
v/s Ratio Prot								c0.39				
v/s Ratio Perm	0.12	0.12						0.06			0.02	
v/c Ratio	0.66	0.66						0.30	0.53	0.02		
Uniform Delay, d1	45.1	45.2						41.9	7.2	4.5		
Progression Factor	0.94	0.94						1.00	1.00	1.00		
Incremental Delay, d2	2.0	2.1						0.6	0.6	0.0		
Delay (s)	44.5	44.5						42.5	7.8	4.5		
Level of Service	D	D						D	A	A		
Approach Delay (s)	44.5		42.5					7.7		0.0		
Approach LOS	D		D					A		A		

Intersection Summary

HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	94.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



# HCM Signalized Intersection Capacity Analysis

## 401: Ten Ten Road & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑↑		↑↑						↑↑	↑
Volume (vph)	0	221	411	0	535	0	0	0	0	0	801	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0						5.0	5.0
Lane Util. Factor		0.95	0.88		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3539	2787		3539						3539	1583
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3539	2787		3539						3539	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	246	457	0	594	0	0	0	0	0	890	160
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	246	457	0	594	0	0	0	0	0	890	160
Turn Type		custom										Perm
Protected Phases		4	4		8	3					6	
Permitted Phases			3									6
Actuated Green, G (s)		23.9	30.4		33.3						72.6	72.6
Effective Green, g (s)		25.9	34.4		37.3						74.6	74.6
Actuated g/C Ratio		0.22	0.29		0.31						0.62	0.62
Clearance Time (s)		7.0	7.0								7.0	7.0
Vehicle Extension (s)		3.0	3.0								3.0	3.0
Lane Grp Cap (vph)		764	915		1100						2200	984
v/s Ratio Prot		0.07	c0.11		c0.17						c0.25	
v/s Ratio Perm			0.06									0.10
v/c Ratio		0.32	0.50		0.54						0.40	0.16
Uniform Delay, d1		39.7	35.6		34.2						11.5	9.6
Progression Factor		1.00	1.00		0.00						0.69	0.73
Incremental Delay, d2		0.2	0.4		0.4						0.5	0.3
Delay (s)		39.9	36.1		0.4						8.5	7.3
Level of Service		D	D		A						A	A
Approach Delay (s)		37.4			0.4			0.0			8.3	
Approach LOS		D			A			A			A	

### Intersection Summary

HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	81.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 401: Ten Ten Road & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑↑		↑↑						↑↑↑	↑
Volume (vph)	0	298	553	0	721	0	0	0	0	0	1078	194
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0						5.0	5.0
Lane Util. Factor		0.95	0.88		0.95						0.91	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3539	2787		3539						5085	1583
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3539	2787		3539						5085	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	331	614	0	801	0	0	0	0	0	1198	216
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	331	614	0	801	0	0	0	0	0	1198	216
Turn Type		custom										Perm
Protected Phases		4	4		8	3					6	
Permitted Phases			3									6
Actuated Green, G (s)		25.5	29.0		29.5						74.0	74.0
Effective Green, g (s)		27.5	33.0		33.5						76.0	76.0
Actuated g/C Ratio		0.23	0.28		0.28						0.63	0.63
Clearance Time (s)		7.0	7.0								7.0	7.0
Vehicle Extension (s)		3.0	3.0								3.0	3.0
Lane Grp Cap (vph)		811	883		988						3221	1003
v/s Ratio Prot		0.09	c0.16		c0.23						c0.24	
v/s Ratio Perm			0.06									0.14
v/c Ratio		0.41	0.70		0.81						0.37	0.22
Uniform Delay, d1		39.3	39.0		40.3						10.6	9.3
Progression Factor		1.00	1.00		0.04						0.70	0.72
Incremental Delay, d2		0.3	2.4		1.5						0.3	0.5
Delay (s)		39.7	41.4		3.3						7.7	7.2
Level of Service		D	D		A						A	A
Approach Delay (s)		40.8			3.3			0.0			7.6	
Approach LOS		D			A			A			A	

### Intersection Summary

HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 401: Ten Ten Road & US 401

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑↑		↑↑						↑↑	↑
Volume (vph)	0	609	337	0	364	0	0	0	0	0	1721	438
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0						5.0	5.0
Lane Util. Factor		0.95	0.88		0.95						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3539	2787		3539						3539	1583
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3539	2787		3539						3539	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	677	374	0	404	0	0	0	0	0	1912	487
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	677	374	0	404	0	0	0	0	0	1912	487
Turn Type		custom										Perm
Protected Phases		4	4		8	3					6	
Permitted Phases			3									6
Actuated Green, G (s)		27.6	31.0		25.5						72.0	72.0
Effective Green, g (s)		29.6	35.0		29.5						74.0	74.0
Actuated g/C Ratio		0.25	0.29		0.25						0.62	0.62
Clearance Time (s)		7.0	7.0								7.0	7.0
Vehicle Extension (s)		3.0	3.0								3.0	3.0
Lane Grp Cap (vph)		873	929		870						2182	976
v/s Ratio Prot		c0.19	c0.10		0.11						c0.54	
v/s Ratio Perm			0.03									0.31
v/c Ratio		0.78	0.40		0.46						0.88	0.50
Uniform Delay, d1		42.1	34.1		38.5						19.2	12.7
Progression Factor		1.00	1.00		0.00						0.94	1.03
Incremental Delay, d2		4.4	0.3		0.4						3.9	1.3
Delay (s)		46.5	34.4		0.5						21.8	14.4
Level of Service		D	C		A						C	B
Approach Delay (s)		42.2			0.5			0.0			20.3	
Approach LOS		D			A			A			C	

### Intersection Summary

HCM Average Control Delay	24.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 401: Ten Ten Road & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑↑		↑↑						↑↑↑	↑
Volume (vph)	0	820	454	0	490	0	0	0	0	0	2317	590
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0						5.0	5.0
Lane Util. Factor		0.95	0.88		0.95						0.91	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		3539	2787		3539						5085	1583
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		3539	2787		3539						5085	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	911	504	0	544	0	0	0	0	0	2574	656
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	911	504	0	544	0	0	0	0	0	2574	656
Turn Type		custom										Perm
Protected Phases		4	4		8	3					6	
Permitted Phases			3									6
Actuated Green, G (s)		40.3	44.0		34.4						59.0	59.0
Effective Green, g (s)		42.3	48.0		38.4						61.0	61.0
Actuated g/C Ratio		0.35	0.40		0.32						0.51	0.51
Clearance Time (s)		7.0	7.0								7.0	7.0
Vehicle Extension (s)		3.0	3.0								3.0	3.0
Lane Grp Cap (vph)		1247	1231		1132						2585	805
v/s Ratio Prot		c0.26	c0.14		0.15						c0.51	
v/s Ratio Perm			0.04									0.41
v/c Ratio		0.73	0.41		0.48						1.00	0.81
Uniform Delay, d1		33.9	25.8		32.8						29.4	24.8
Progression Factor		1.00	1.00		0.00						0.78	0.73
Incremental Delay, d2		2.2	0.2		0.3						12.6	5.4
Delay (s)		36.1	26.1		0.3						35.6	23.6
Level of Service		D	C		A						D	C
Approach Delay (s)		32.5			0.3			0.0			33.2	
Approach LOS		C			A			A			C	

### Intersection Summary

HCM Average Control Delay	29.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 402: Ten Ten Road & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↑↑		↑↑	↑			
Volume (vph)	0	221	0	0	535	274	0	2094	82	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0	5.0			
Lane Util. Factor		0.95			0.95	0.88		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3539			3539	2787		3539	1583			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3539			3539	2787		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	246	0	0	594	304	0	2327	91	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	246	0	0	594	304	0	2327	91	0	0	0
Turn Type					custom			Perm				
Protected Phases		4 7			8	8		2				
Permitted Phases						7			2			
Actuated Green, G (s)		27.5			26.8	30.4		72.6	72.6			
Effective Green, g (s)		31.5			28.8	34.4		74.6	74.6			
Actuated g/C Ratio		0.26			0.24	0.29		0.62	0.62			
Clearance Time (s)					7.0	7.0		7.0	7.0			
Vehicle Extension (s)					3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		929			849	915		2200	984			
v/s Ratio Prot		0.07			c0.17	c0.08		c0.66				
v/s Ratio Perm						0.03			0.06			
v/c Ratio		0.26			0.70	0.33		1.06	0.09			
Uniform Delay, d1		35.1			41.6	33.7		22.7	9.1			
Progression Factor		0.00			0.70	0.73		0.79	0.86			
Incremental Delay, d2		0.1			2.3	0.2		33.7	0.1			
Delay (s)		0.2			31.5	24.9		51.7	7.9			
Level of Service		A			C	C		D	A			
Approach Delay (s)		0.2			29.3			50.0			0.0	
Approach LOS		A			C			D			A	

### Intersection Summary

HCM Average Control Delay	41.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	81.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 402: Ten Ten Road & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↑↑		↑↑↑	↑			
Volume (vph)	0	298	0	0	721	369	0	2821	111	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0	5.0			
Lane Util. Factor		0.95			0.95	0.88		0.91	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3539			3539	2787		5085	1583			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3539			3539	2787		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	331	0	0	801	410	0	3134	123	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	331	0	0	801	410	0	3134	123	0	0	0
Turn Type					custom			Perm				
Protected Phases		4 7			8	8		2				
Permitted Phases						7			2			
Actuated Green, G (s)		28.5			26.0	29.0		74.0	74.0			
Effective Green, g (s)		32.5			28.0	33.0		76.0	76.0			
Actuated g/C Ratio		0.27			0.23	0.28		0.63	0.63			
Clearance Time (s)					7.0	7.0		7.0	7.0			
Vehicle Extension (s)					3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		958			826	883		3221	1003			
v/s Ratio Prot		0.09			c0.23	c0.11		c0.62				
v/s Ratio Perm						0.04			0.08			
v/c Ratio		0.35			0.97	0.46		0.97	0.12			
Uniform Delay, d1		35.2			45.6	36.2		21.0	8.7			
Progression Factor		0.00			0.77	0.62		0.69	0.90			
Incremental Delay, d2		0.2			20.8	0.3		8.1	0.2			
Delay (s)		0.2			55.7	22.7		22.7	8.0			
Level of Service		A			E	C		C	A			
Approach Delay (s)		0.2			44.5			22.1			0.0	
Approach LOS		A			D			C			A	

### Intersection Summary

HCM Average Control Delay	26.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 402: Ten Ten Road & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↑↑		↑↑	↑			
Volume (vph)	0	609	0	0	364	271	0	1386	150	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0	5.0			
Lane Util. Factor		0.95			0.95	0.88		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3539			3539	2787		3539	1583			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3539			3539	2787		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	677	0	0	404	301	0	1540	167	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	677	0	0	404	301	0	1540	167	0	0	0
Turn Type					custom				Perm			
Protected Phases		4 7			8	8		2				
Permitted Phases						7			2			
Actuated Green, G (s)		36.5			22.1	31.0		72.0	72.0			
Effective Green, g (s)		40.0			24.1	35.0		74.0	74.0			
Actuated g/C Ratio		0.33			0.20	0.29		0.62	0.62			
Clearance Time (s)					7.0	7.0		7.0	7.0			
Vehicle Extension (s)					3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)	1180				711	929		2182	976			
v/s Ratio Prot		c0.19			0.11	0.07		c0.44				
v/s Ratio Perm						0.04			0.11			
v/c Ratio		0.57			0.57	0.32		0.71	0.17			
Uniform Delay, d1		33.0			43.3	33.2		15.6	9.9			
Progression Factor		0.00			0.91	1.00		0.82	0.83			
Incremental Delay, d2		0.4			1.0	0.2		1.7	0.3			
Delay (s)		0.4			40.6	33.4		14.5	8.5			
Level of Service		A			D	C		B	A			
Approach Delay (s)		0.4			37.5			13.9			0.0	
Approach LOS		A			D			B			A	

### Intersection Summary

HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 402: Ten Ten Road & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑	↑↑		↑↑↑	↑			
Volume (vph)	0	820	0	0	490	365	0	1867	202	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0		5.0	5.0			
Lane Util. Factor		0.95			0.95	0.88		0.91	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		3539			3539	2787		5085	1583			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		3539			3539	2787		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	911	0	0	544	406	0	2074	224	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	911	0	0	544	406	0	2074	224	0	0	0
Turn Type					custom			Perm				
Protected Phases		4 7			8	8		2				
Permitted Phases						7			2			
Actuated Green, G (s)		51.0			30.7	44.0		59.0	59.0			
Effective Green, g (s)		53.0			32.7	48.0		61.0	61.0			
Actuated g/C Ratio		0.44			0.27	0.40		0.51	0.51			
Clearance Time (s)					7.0	7.0		7.0	7.0			
Vehicle Extension (s)					3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)		1563			964	1231		2585	805			
v/s Ratio Prot		c0.26			0.15	0.09		c0.41				
v/s Ratio Perm						0.06			0.14			
v/c Ratio		0.58			0.56	0.33		0.80	0.28			
Uniform Delay, d1		25.2			37.5	24.9		24.5	16.9			
Progression Factor		0.00			0.96	1.21		0.81	0.79			
Incremental Delay, d2		0.4			0.7	0.1		2.4	0.8			
Delay (s)		0.4			36.6	30.3		22.2	14.2			
Level of Service		A			D	C		C	B			
Approach Delay (s)		0.4			33.9			21.4			0.0	
Approach LOS		A			C			C			A	

### Intersection Summary

HCM Average Control Delay	19.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



# HCM Signalized Intersection Capacity Analysis

## 501: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↕↕
Volume (vph)	235	0	0	0	0	637
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	261	0	0	0	0	708
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	261	0	0	0	0	708
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	14.6					91.4
Effective Green, g (s)	16.6					93.4
Actuated g/C Ratio	0.14					0.78
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	475					2755
v/s Ratio Prot	c0.08					c0.20
v/s Ratio Perm						
v/c Ratio	0.55					0.26
Uniform Delay, d1	48.2					3.7
Progression Factor	1.09					1.00
Incremental Delay, d2	0.4					0.2
Delay (s)	52.8					3.9
Level of Service	D					A
Approach Delay (s)	52.8		0.0			3.9
Approach LOS	D		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			17.1		HCM Level of Service	B
HCM Volume to Capacity ratio			0.30			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			84.4%		ICU Level of Service	E
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM Signalized Intersection Capacity Analysis

## 501: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶↶					↷↷↷
Volume (vph)	316	0	0	0	0	960
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	351	0	0	0	0	1067
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	351	0	0	0	0	1067
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	17.7					88.3
Effective Green, g (s)	19.7					90.3
Actuated g/C Ratio	0.16					0.75
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	564					3826
v/s Ratio Prot	c0.10					c0.21
v/s Ratio Perm						
v/c Ratio	0.62					0.28
Uniform Delay, d1	46.7					4.7
Progression Factor	1.08					1.00
Incremental Delay, d2	0.8					0.2
Delay (s)	51.0					4.8
Level of Service	D					A
Approach Delay (s)	51.0		0.0			4.8
Approach LOS	D		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			16.3		HCM Level of Service	B
HCM Volume to Capacity ratio			0.34			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			81.8%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 501: North Median Break & US 401

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶↶					↷↷
Volume (vph)	579	0	0	0	0	1584
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	643	0	0	0	0	1760
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	643	0	0	0	0	1760
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	28.2					77.8
Effective Green, g (s)	30.2					79.8
Actuated g/C Ratio	0.25					0.66
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	864					2353
v/s Ratio Prot	c0.19					c0.50
v/s Ratio Perm						
v/c Ratio	0.74					0.75
Uniform Delay, d1	41.3					13.4
Progression Factor	1.17					1.00
Incremental Delay, d2	2.7					2.2
Delay (s)	51.0					15.6
Level of Service	D					B
Approach Delay (s)	51.0		0.0			15.6
Approach LOS	D		A			B
<b>Intersection Summary</b>						
HCM Average Control Delay			25.1		HCM Level of Service	C
HCM Volume to Capacity ratio			0.75			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			82.7%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 501: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙↘					↑↑↑
Volume (vph)	780	0	0	0	0	2234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	867	0	0	0	0	2482
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	867	0	0	0	0	2482
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	33.9					72.1
Effective Green, g (s)	35.9					74.1
Actuated g/C Ratio	0.30					0.62
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	1027					3140
v/s Ratio Prot	c0.25					c0.49
v/s Ratio Perm						
v/c Ratio	0.84					0.79
Uniform Delay, d1	39.4					17.1
Progression Factor	0.87					1.00
Incremental Delay, d2	4.6					2.1
Delay (s)	39.0					19.3
Level of Service	D					B
Approach Delay (s)	39.0		0.0		19.3	
Approach LOS	D		A		B	

### Intersection Summary

HCM Average Control Delay	24.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 504: Autozone / Smithfields Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕				↗		↕↕	↗			
Volume (vph)	0	299	0	0	0	230	0	2057	88	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		0.95				1.00		0.95	1.00			
Frt		1.00				0.86		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		3539				1611		3539	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		3539				1611		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	332	0	0	0	256	0	2286	98	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	332	0	0	0	256	0	2286	98	0	0	0
Turn Type	Perm					custom				Perm		
Protected Phases		4						2				
Permitted Phases	4					8			2			
Actuated Green, G (s)		21.4				21.4		84.6	84.6			
Effective Green, g (s)		23.4				23.4		86.6	86.6			
Actuated g/C Ratio		0.19				0.19		0.72	0.72			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		690				314		2554	1142			
v/s Ratio Prot		0.09						c0.65				
v/s Ratio Perm						c0.16			0.06			
v/c Ratio		0.48				0.82		0.90	0.09			
Uniform Delay, d1		42.9				46.2		13.1	5.0			
Progression Factor		1.00				0.81		0.24	0.48			
Incremental Delay, d2		0.5				14.4		1.6	0.0			
Delay (s)		43.4				51.8		4.7	2.4			
Level of Service		D				D		A	A			
Approach Delay (s)		43.4			51.8			4.6			0.0	
Approach LOS		D			D			A			A	

### Intersection Summary

HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	97.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 504: Autozone / Smithfields Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕				↗		↕↕↕	↗			
Volume (vph)	0	374	0	0	0	298	0	2799	89	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		0.95				1.00		0.91	1.00			
Frt		1.00				0.86		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		3539				1611		5085	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		3539				1611		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	416	0	0	0	331	0	3110	99	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	416	0	0	0	331	0	3110	99	0	0	0
Turn Type	Perm					custom				Perm		
Protected Phases		4						2				
Permitted Phases	4					8			2			
Actuated Green, G (s)		26.4				26.4		79.6	79.6			
Effective Green, g (s)		28.4				28.4		81.6	81.6			
Actuated g/C Ratio		0.24				0.24		0.68	0.68			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		838				381		3458	1076			
v/s Ratio Prot		0.12						c0.61				
v/s Ratio Perm						c0.21			0.06			
v/c Ratio		0.50				0.87		0.90	0.09			
Uniform Delay, d1		39.6				44.0		15.8	6.6			
Progression Factor		1.00				0.78		0.30	0.51			
Incremental Delay, d2		0.5				17.6		1.7	0.1			
Delay (s)		40.1				52.1		6.5	3.4			
Level of Service		D				D		A	A			
Approach Delay (s)		40.1			52.1			6.4			0.0	
Approach LOS		D			D			A			A	

Intersection Summary

HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	100.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 504: Autozone / Smithfields Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕				↗		↕↕	↗			
Volume (vph)	0	521	0	0	0	186	0	1070	69	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		0.95				1.00		0.95	1.00			
Frt		1.00				0.86		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		3539				1611		3539	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		3539				1611		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	579	0	0	0	207	0	1189	77	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	579	0	0	0	207	0	1189	77	0	0	0
Turn Type	Perm					custom				Perm		
Protected Phases		4						2				
Permitted Phases	4					8			2			
Actuated Green, G (s)		25.4				25.4		80.6	80.6			
Effective Green, g (s)		27.4				27.4		82.6	82.6			
Actuated g/C Ratio		0.23				0.23		0.69	0.69			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		808				368		2436	1090			
v/s Ratio Prot		c0.16						c0.34				
v/s Ratio Perm						0.13			0.05			
v/c Ratio		0.72				0.56		0.49	0.07			
Uniform Delay, d1		42.7				41.0		8.8	6.1			
Progression Factor		1.00				0.94		0.44	0.39			
Incremental Delay, d2		3.0				1.9		0.5	0.1			
Delay (s)		45.8				40.5		4.4	2.5			
Level of Service		D				D		A	A			
Approach Delay (s)		45.8			40.5			4.3			0.0	
Approach LOS		D			D			A			A	

### Intersection Summary

HCM Average Control Delay	19.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	94.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 504: Autozone / Smithfields Access & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕				↗		↕↕↕	↗			
Volume (vph)	0	683	0	0	0	219	0	1460	73	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		0.95				1.00		0.91	1.00			
Frt		1.00				0.86		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		3539				1611		5085	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		3539				1611		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	759	0	0	0	243	0	1622	81	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	759	0	0	0	243	0	1622	81	0	0	0
Turn Type	Perm					custom				Perm		
Protected Phases		4						2				
Permitted Phases	4					8			2			
Actuated Green, G (s)		32.7				32.7		73.3	73.3			
Effective Green, g (s)		34.7				34.7		75.3	75.3			
Actuated g/C Ratio		0.29				0.29		0.63	0.63			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		1023				466		3191	993			
v/s Ratio Prot		c0.21						c0.32				
v/s Ratio Perm						0.15			0.05			
v/c Ratio		0.74				0.52		0.51	0.08			
Uniform Delay, d1		38.6				35.7		12.2	8.8			
Progression Factor		1.00				1.30		0.46	0.57			
Incremental Delay, d2		2.9				1.0		0.4	0.1			
Delay (s)		41.5				47.3		6.1	5.1			
Level of Service		D				D		A	A			
Approach Delay (s)		41.5			47.3			6.0			0.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	19.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	94.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



# HCM Unsignalized Intersection Capacity Analysis

## 601: Ten Ten Road & Harris Teeter Access

7/5/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗	↖	↑↑	↗	↖
Volume (veh/h)	290	14	49	782	27	16
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	322	16	54	869	30	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	626					
pX, platoon unblocked			0.96		0.96	0.96
vC, conflicting volume			338		866	161
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			229		778	45
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		90	98
cM capacity (veh/h)			1284		306	975

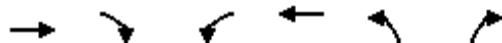
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	
Volume Total	161	161	16	54	434	434	30	18	
Volume Left	0	0	0	54	0	0	30	0	
Volume Right	0	0	16	0	0	0	0	18	
cSH	1700	1700	1700	1284	1700	1700	306	975	
Volume to Capacity	0.09	0.09	0.01	0.04	0.26	0.26	0.10	0.02	
Queue Length 95th (ft)	0	0	0	3	0	0	8	1	
Control Delay (s)	0.0	0.0	0.0	7.9	0.0	0.0	18.0	8.8	
Lane LOS				A				C	A
Approach Delay (s)	0.0			0.5			14.6		
Approach LOS							B		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	31.6%	ICU Level of Service	A
Analysis Period (min)	15		

# HCM Unsignalized Intersection Capacity Analysis

## 601: Ten Ten Road & Harris Teeter Access

7/5/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↵	↑↑	↵	↑
Volume (veh/h)	391	18	66	1053	36	22
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	434	20	73	1170	40	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	615					
pX, platoon unblocked			0.94		0.94	0.94
vC, conflicting volume			454		1166	217
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			281		1041	28
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		80	97
cM capacity (veh/h)			1197		198	975

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	217	217	20	73	585	585	40	24
Volume Left	0	0	0	73	0	0	40	0
Volume Right	0	0	20	0	0	0	0	24
cSH	1700	1700	1700	1197	1700	1700	198	975
Volume to Capacity	0.13	0.13	0.01	0.06	0.34	0.34	0.20	0.03
Queue Length 95th (ft)	0	0	0	5	0	0	18	2
Control Delay (s)	0.0	0.0	0.0	8.2	0.0	0.0	27.7	8.8
Lane LOS				A				A
Approach Delay (s)	0.0			0.5			20.5	
Approach LOS							C	

### Intersection Summary

Average Delay	1.1	
Intersection Capacity Utilization	39.1%	ICU Level of Service A
Analysis Period (min)	15	

# HCM Unsignalized Intersection Capacity Analysis

## 601: Ten Ten Road & Harris Teeter Access

7/5/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↵	↑↑	↵	↑
Volume (veh/h)	756	2	69	602	33	107
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	840	2	77	669	37	119
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	618					
pX, platoon unblocked			0.84		0.84	0.84
vC, conflicting volume			842		1328	420
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			446		1020	0
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		80	87
cM capacity (veh/h)			938		180	916

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	
Volume Total	420	420	2	77	334	334	37	119	
Volume Left	0	0	0	77	0	0	37	0	
Volume Right	0	0	2	0	0	0	0	119	
cSH	1700	1700	1700	938	1700	1700	180	916	
Volume to Capacity	0.25	0.25	0.00	0.08	0.20	0.20	0.20	0.13	
Queue Length 95th (ft)	0	0	0	7	0	0	18	11	
Control Delay (s)	0.0	0.0	0.0	9.2	0.0	0.0	30.0	9.5	
Lane LOS				A				D	A
Approach Delay (s)	0.0			0.9			14.3		
Approach LOS							B		

Intersection Summary			
Average Delay			1.7
Intersection Capacity Utilization	38.1%		ICU Level of Service
Analysis Period (min)	15		A

# HCM Unsignalized Intersection Capacity Analysis

## 601: Ten Ten Road & Harris Teeter Access

7/5/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↵	↑↑	↵	↑
Volume (veh/h)	1019	3	93	811	45	144
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	1132	3	103	901	50	160
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	632					
pX, platoon unblocked			0.81		0.81	0.81
vC, conflicting volume			1136		1789	566
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			685		1497	0
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			86		36	82
cM capacity (veh/h)			728		78	873

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	566	566	3	103	451	451	50	160
Volume Left	0	0	0	103	0	0	50	0
Volume Right	0	0	3	0	0	0	0	160
cSH	1700	1700	1700	728	1700	1700	78	873
Volume to Capacity	0.33	0.33	0.00	0.14	0.27	0.27	0.64	0.18
Queue Length 95th (ft)	0	0	0	12	0	0	73	17
Control Delay (s)	0.0	0.0	0.0	10.8	0.0	0.0	110.4	10.0
Lane LOS				B			F	B
Approach Delay (s)	0.0			1.1			33.9	
Approach LOS							D	

Intersection Summary			
Average Delay		3.5	
Intersection Capacity Utilization	46.7%		ICU Level of Service A
Analysis Period (min)		15	

# HCM Signalized Intersection Capacity Analysis

## 701: Ten Ten Road & Loop Road

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↗	↗	
Volume (vph)	84	172	50	50	706	248	50	50	50	202	50	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.93		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3419		1770	3539	1583	1770	1723		3433	1696	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3419		1770	3539	1583	1770	1723		3433	1696	
Peak-hour factor, 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
Adj. Flow (vph)	93	191	56	56	784	276	56	56	56	224	56	83
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	93	247	0	56	784	276	56	112	0	224	139	0
Turn Type	Prot			Prot		pm+ov	Prot				Prot	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	10.8	59.6		5.6	54.4	67.2	9.3	14.0		12.8	17.5	
Effective Green, g (s)	12.8	61.6		7.6	56.4	71.2	11.3	16.0		14.8	19.5	
Actuated g/C Ratio	0.11	0.51		0.06	0.47	0.59	0.09	0.13		0.12	0.16	
Clearance Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	189	1755		112	1663	1005	167	230		423	276	
v/s Ratio Prot	c0.05	0.07		0.03	c0.22	0.03	0.03	c0.07		0.07	c0.08	
v/s Ratio Perm						0.14						
v/c Ratio	0.49	0.14		0.50	0.47	0.27	0.34	0.49		0.53	0.50	
Uniform Delay, d1	50.5	15.3		54.4	21.7	11.9	50.8	48.2		49.3	45.8	
Progression Factor	0.56	0.74		1.00	1.00	1.00	1.00	1.00		0.92	0.96	
Incremental Delay, d2	2.0	0.2		3.5	1.0	0.1	1.2	1.6		1.1	1.4	
Delay (s)	30.2	11.5		57.8	22.6	12.0	52.0	49.8		46.5	45.5	
Level of Service	C	B		E	C	B	D	D		D	D	
Approach Delay (s)		16.6			21.8			50.6			46.1	
Approach LOS		B			C			D			D	

### Intersection Summary

HCM Average Control Delay	27.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 701: Ten Ten Road & Loop Road

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	84	278	50	50	994	305	50	50	50	261	50	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.93		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3458		1770	3539	1583	1770	1723		3433	1696	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3458		1770	3539	1583	1770	1723		3433	1696	
Peak-hour factor, 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
Adj. Flow (vph)	93	309	56	56	1104	339	56	56	56	290	56	83
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	93	365	0	56	1104	339	56	112	0	290	139	0
Turn Type	Prot			Prot		pm+ov	Prot				Prot	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	11.3	58.6		5.7	53.0	68.3	8.0	12.4		15.3	19.7	
Effective Green, g (s)	13.3	60.6		7.7	55.0	72.3	10.0	14.4		17.3	21.7	
Actuated g/C Ratio	0.11	0.51		0.06	0.46	0.60	0.08	0.12		0.14	0.18	
Clearance Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	196	1746		114	1622	1020	148	207		495	307	
v/s Ratio Prot	c0.05	0.11		0.03	c0.31	0.05	0.03	c0.07		c0.08	c0.08	
v/s Ratio Perm						0.17						
v/c Ratio	0.47	0.21		0.49	0.68	0.33	0.38	0.54		0.59	0.45	
Uniform Delay, d1	50.1	16.4		54.3	25.6	11.9	52.1	49.7		48.0	43.9	
Progression Factor	0.56	0.63		1.00	1.00	1.00	1.00	1.00		0.59	0.57	
Incremental Delay, d2	1.8	0.3		3.3	2.3	0.2	1.6	2.9		1.7	1.0	
Delay (s)	29.6	10.7		57.6	27.9	12.0	53.7	52.6		29.8	26.0	
Level of Service	C	B		E	C	B	D	D		C	C	
Approach Delay (s)		14.5			25.4			52.9			28.6	
Approach LOS		B			C			D			C	

### Intersection Summary

HCM Average Control Delay	25.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 701: Ten Ten Road & Loop Road

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↗	↗	
Volume (vph)	55	758	50	50	432	105	50	50	50	479	50	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.93		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3506		1770	3539	1583	1770	1723		3433	1642	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3506		1770	3539	1583	1770	1723		3433	1642	
Peak-hour factor, 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
Adj. Flow (vph)	61	842	56	56	480	117	56	56	56	532	56	210
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	61	898	0	56	480	117	56	112	0	532	266	0
Turn Type	Prot			Prot		pm+ov	Prot			Prot		
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	6.3	49.5		5.6	48.8	73.3	10.0	12.4		24.5	26.9	
Effective Green, g (s)	8.3	51.5		7.6	50.8	77.3	12.0	14.4		26.5	28.9	
Actuated g/C Ratio	0.07	0.43		0.06	0.42	0.64	0.10	0.12		0.22	0.24	
Clearance Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	122	1505		112	1498	1020	177	207		758	395	
v/s Ratio Prot	0.03	c0.26		c0.03	0.14	0.03	0.03	0.07		c0.15	c0.16	
v/s Ratio Perm						0.05						
v/c Ratio	0.50	0.60		0.50	0.32	0.11	0.32	0.54		0.70	0.67	
Uniform Delay, d1	53.8	26.3		54.4	23.1	8.2	50.2	49.7		43.1	41.3	
Progression Factor	1.55	0.37		1.00	1.00	1.00	1.00	1.00		0.50	0.38	
Incremental Delay, d2	2.9	1.6		3.5	0.6	0.1	1.0	2.9		2.8	4.2	
Delay (s)	86.4	11.3		57.8	23.6	8.3	51.2	52.6		24.3	19.8	
Level of Service	F	B		E	C	A	D	D		C	B	
Approach Delay (s)		16.1			23.8			52.1			22.8	
Approach LOS		B			C			D			C	

### Intersection Summary

HCM Average Control Delay	22.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 701: Ten Ten Road & Loop Road

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↗	↗	↖
Volume (vph)	55	1058	50	50	665	122	50	50	50	614	50	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.93		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3515		1770	3539	1583	1770	1723		3433	1642	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3515		1770	3539	1583	1770	1723		3433	1642	
Peak-hour factor, 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
Adj. Flow (vph)	61	1176	56	56	739	136	56	56	56	682	56	210
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	61	1232	0	56	739	136	56	112	0	682	266	0
Turn Type	Prot			Prot		pm+ov	Prot				Prot	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases						6						
Actuated Green, G (s)	5.8	50.4		5.6	50.2	73.2	10.2	13.0		23.0	25.8	
Effective Green, g (s)	7.8	52.4		7.6	52.2	77.2	12.2	15.0		25.0	27.8	
Actuated g/C Ratio	0.06	0.44		0.06	0.44	0.64	0.10	0.12		0.21	0.23	
Clearance Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	115	1535		112	1539	1084	180	215		715	380	
v/s Ratio Prot	0.03	c0.35		0.03	c0.21	0.03	0.03	c0.07		c0.20	0.16	
v/s Ratio Perm						0.06						
v/c Ratio	0.53	0.80		0.50	0.48	0.13	0.31	0.52		0.95	0.70	
Uniform Delay, d1	54.3	29.3		54.4	24.2	8.3	50.0	49.1		46.9	42.3	
Progression Factor	1.49	0.39		1.00	1.00	1.00	1.00	1.00		0.43	0.43	
Incremental Delay, d2	4.1	4.0		3.5	1.1	0.1	1.0	2.3		21.4	5.1	
Delay (s)	85.1	15.6		57.8	25.3	8.4	51.0	51.4		41.7	23.2	
Level of Service	F	B		E	C	A	D	D		D	C	
Approach Delay (s)		18.9			24.8			51.3			36.5	
Approach LOS		B			C			D			D	

### Intersection Summary

HCM Average Control Delay	27.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



# **Appendix B: US 401 & Hilltop- Needmore Road Level of Service Analysis**

# Superstreet Option

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←			↑↑		
Volume (vph)	386	0	0	1623	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3433			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3433			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	429	0	0	1803	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	429	0	0	1803	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	14.9			61.1		
Effective Green, g (s)	16.9			63.1		
Actuated g/C Ratio	0.19			0.70		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	645			2481		
v/s Ratio Prot	c0.12			c0.51		
v/s Ratio Perm						
v/c Ratio	0.67			0.73		
Uniform Delay, d1	33.9			8.2		
Progression Factor	0.72			1.00		
Incremental Delay, d2	2.5			1.9		
Delay (s)	27.0			10.1		
Level of Service	C			B		
Approach Delay (s)	27.0			10.1	0.0	
Approach LOS	C			B	A	

### Intersection Summary

HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←			↑↑↑		
Volume (vph)	517	0	0	2185	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	0.97			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3433			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3433			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	574	0	0	2428	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	574	0	0	2428	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	19.1			56.9		
Effective Green, g (s)	21.1			58.9		
Actuated g/C Ratio	0.23			0.65		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	805			3328		
v/s Ratio Prot	c0.17			c0.48		
v/s Ratio Perm						
v/c Ratio	0.71			0.73		
Uniform Delay, d1	31.7			10.3		
Progression Factor	0.68			1.00		
Incremental Delay, d2	2.8			1.4		
Delay (s)	24.3			11.7		
Level of Service	C			B		
Approach Delay (s)	24.3			11.7	0.0	
Approach LOS	C			B	A	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←			↑↑		
Volume (vph)	676	0	0	867	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3433			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3433			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	751	0	0	963	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	751	0	0	963	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	25.5			50.5		
Effective Green, g (s)	27.5			52.5		
Actuated g/C Ratio	0.31			0.58		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	1049			2064		
v/s Ratio Prot	c0.22			c0.27		
v/s Ratio Perm						
v/c Ratio	0.72			0.47		
Uniform Delay, d1	27.8			10.7		
Progression Factor	0.76			1.00		
Incremental Delay, d2	1.5			0.8		
Delay (s)	22.7			11.5		
Level of Service	C			B		
Approach Delay (s)	22.7			11.5	0.0	
Approach LOS	C			B	A	

### Intersection Summary

HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←			↑↑↑		
Volume (vph)	910	0	0	1169	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	0.97			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3433			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3433			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1011	0	0	1299	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1011	0	0	1299	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	33.6			42.4		
Effective Green, g (s)	35.6			44.4		
Actuated g/C Ratio	0.40			0.49		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	1358			2509		
v/s Ratio Prot	c0.29			c0.26		
v/s Ratio Perm						
v/c Ratio	0.74			0.52		
Uniform Delay, d1	23.3			15.5		
Progression Factor	0.64			1.00		
Incremental Delay, d2	1.3			0.8		
Delay (s)	16.2			16.3		
Level of Service	B			B		
Approach Delay (s)	16.2			16.3	0.0	
Approach LOS	B			B	A	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↗			↕↕	↘
Volume (vph)	0	309	0	0	779	474
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0
Lane Util. Factor		0.88			0.95	1.00
Frt		0.85			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		2787			3539	1583
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		2787			3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	343	0	0	866	527
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	343	0	0	866	527
Turn Type		custom				custom
Protected Phases		4			6	
Permitted Phases						6 4
Actuated Green, G (s)		17.1			58.9	90.0
Effective Green, g (s)		19.1			60.9	90.0
Actuated g/C Ratio		0.21			0.68	1.00
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		591			2395	1583
v/s Ratio Prot		c0.12			c0.24	
v/s Ratio Perm						0.33
v/c Ratio		0.58			0.36	0.33
Uniform Delay, d1		31.8			6.2	0.0
Progression Factor		1.00			0.88	1.00
Incremental Delay, d2		1.5			0.4	0.1
Delay (s)		33.3			5.9	0.1
Level of Service		C			A	A
Approach Delay (s)	33.3			0.0	3.7	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	40.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↗			↕↕↕	↘
Volume (vph)	0	416	0	0	1048	637
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0
Lane Util. Factor		0.88			0.91	1.00
Frt		0.85			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		2787			5085	1583
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		2787			5085	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	462	0	0	1164	708
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	462	0	0	1164	708
Turn Type		custom				custom
Protected Phases		4			6	
Permitted Phases						6 4
Actuated Green, G (s)		22.0			54.0	90.0
Effective Green, g (s)		24.0			56.0	90.0
Actuated g/C Ratio		0.27			0.62	1.00
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		743			3164	1583
v/s Ratio Prot		c0.17			0.23	
v/s Ratio Perm						c0.45
v/c Ratio		0.62			0.37	0.45
Uniform Delay, d1		29.0			8.3	0.0
Progression Factor		1.00			0.80	1.00
Incremental Delay, d2		1.6			0.3	0.2
Delay (s)		30.6			7.0	0.2
Level of Service		C			A	A
Approach Delay (s)	30.6			0.0	4.4	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↘			↕↕	↗
Volume (vph)	0	505	0	0	1528	462
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0
Lane Util. Factor		0.88			0.95	1.00
Frt		0.85			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		2787			3539	1583
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		2787			3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	561	0	0	1698	513
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	561	0	0	1698	513
Turn Type		custom			custom	
Protected Phases		4			6	
Permitted Phases						6 4
Actuated Green, G (s)		22.1			53.9	90.0
Effective Green, g (s)		24.1			55.9	90.0
Actuated g/C Ratio		0.27			0.62	1.00
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		746			2198	1583
v/s Ratio Prot		c0.20			c0.48	
v/s Ratio Perm						0.32
v/c Ratio		0.75			0.77	0.32
Uniform Delay, d1		30.2			12.4	0.0
Progression Factor		1.00			0.67	1.00
Incremental Delay, d2		4.3			1.9	0.1
Delay (s)		34.5			10.3	0.1
Level of Service		C			B	A
Approach Delay (s)	34.5			0.0	7.9	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↗			↕↕↕	↘
Volume (vph)	0	680	0	0	2059	622
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0
Lane Util. Factor		0.88			0.91	1.00
Frt		0.85			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		2787			5085	1583
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		2787			5085	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	756	0	0	2288	691
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	756	0	0	2288	691
Turn Type		custom				custom
Protected Phases		4			6	
Permitted Phases						6 4
Actuated Green, G (s)		28.3			47.7	90.0
Effective Green, g (s)		30.3			49.7	90.0
Actuated g/C Ratio		0.34			0.55	1.00
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		938			2808	1583
v/s Ratio Prot		c0.27			c0.45	
v/s Ratio Perm						0.44
v/c Ratio		0.81			0.81	0.44
Uniform Delay, d1		27.2			16.4	0.0
Progression Factor		1.00			0.66	1.00
Incremental Delay, d2		5.1			1.9	0.1
Delay (s)		32.3			12.7	0.1
Level of Service		C			B	A
Approach Delay (s)	32.3			0.0	9.8	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 102: Air Park Road & US 401 NB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	NBR2	SBL	SBT	NWL	NWR	NWR2
Lane Configurations										
Volume (vph)	0	204	1855	95	58	0	0	0	334	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0	5.0	5.0					5.0	
Lane Util. Factor		1.00	0.95	1.00					0.88	
Frt		0.86	1.00	0.85					0.85	
Flt Protected		1.00	1.00	1.00					1.00	
Satd. Flow (prot)		1611	3539	1583					2787	
Flt Permitted		1.00	1.00	1.00					1.00	
Satd. Flow (perm)		1611	3539	1583					2787	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	227	2061	106	64	0	0	0	371	19
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	227	2061	170	0	0	0	0	390	0
Turn Type		Free		Perm					custom	
Protected Phases			2						3	
Permitted Phases		Free		2						
Actuated Green, G (s)		90.0	60.7	60.7					15.3	
Effective Green, g (s)		90.0	62.7	62.7					17.3	
Actuated g/C Ratio		1.00	0.70	0.70					0.19	
Clearance Time (s)			7.0	7.0					7.0	
Vehicle Extension (s)			2.0	2.0					3.0	
Lane Grp Cap (vph)		1611	2466	1103					536	
v/s Ratio Prot			c0.58						c0.14	
v/s Ratio Perm		0.14		0.11						
v/c Ratio		0.14	0.84	0.15					0.73	
Uniform Delay, d1		0.0	9.9	4.6					34.1	
Progression Factor		1.00	0.60	0.74					1.00	
Incremental Delay, d2		0.2	2.5	0.2					4.9	
Delay (s)		0.2	8.4	3.6					39.0	
Level of Service		A	A	A					D	
Approach Delay (s)	0.2		8.1			0.0	39.0			
Approach LOS	A		A			A	D			

### Intersection Summary

HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 102: Air Park Road & US 401 NB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	NBR2	SBL	SBT	NWL	NWR	NWR2
Lane Configurations										
Volume (vph)	0	275	2498	127	77	0	0	0	451	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0	5.0	5.0					5.0	
Lane Util. Factor		1.00	0.91	1.00					0.88	
Frt		0.86	1.00	0.85					0.85	
Flt Protected		1.00	1.00	1.00					1.00	
Satd. Flow (prot)		1611	5085	1583					2787	
Flt Permitted		1.00	1.00	1.00					1.00	
Satd. Flow (perm)		1611	5085	1583					2787	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	306	2776	141	86	0	0	0	501	26
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	306	2776	227	0	0	0	0	527	0
Turn Type		Free		Perm						custom
Protected Phases			2							3
Permitted Phases		Free		2						
Actuated Green, G (s)		90.0	56.2	56.2					19.8	
Effective Green, g (s)		90.0	58.2	58.2					21.8	
Actuated g/C Ratio		1.00	0.65	0.65					0.24	
Clearance Time (s)			7.0	7.0					7.0	
Vehicle Extension (s)			2.0	2.0					3.0	
Lane Grp Cap (vph)		1611	3288	1024					675	
v/s Ratio Prot			c0.55						c0.19	
v/s Ratio Perm		0.19		0.14						
v/c Ratio		0.19	0.84	0.22					0.78	
Uniform Delay, d1		0.0	12.4	6.6					31.9	
Progression Factor		1.00	0.55	0.70					1.00	
Incremental Delay, d2		0.3	2.0	0.3					5.8	
Delay (s)		0.3	8.7	4.9					37.7	
Level of Service		A	A	A					D	
Approach Delay (s)	0.3		8.5			0.0	37.7			
Approach LOS	A		A			A	D			

### Intersection Summary

HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 102: Air Park Road & US 401 NB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	NBR2	SBL	SBT	NWL	NWR	NWR2
Lane Configurations										
Volume (vph)	0	180	1088	250	205	0	0	0	176	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0	5.0	5.0					5.0	
Lane Util. Factor		1.00	0.95	1.00					0.88	
Frt		0.86	1.00	0.85					0.85	
Flt Protected		1.00	1.00	1.00					1.00	
Satd. Flow (prot)		1611	3539	1583					2787	
Flt Permitted		1.00	1.00	1.00					1.00	
Satd. Flow (perm)		1611	3539	1583					2787	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	200	1209	278	228	0	0	0	196	13
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	200	1209	506	0	0	0	0	209	0
Turn Type		Free		Perm					custom	
Protected Phases			2						3	
Permitted Phases		Free		2						
Actuated Green, G (s)		90.0	64.0	64.0					12.0	
Effective Green, g (s)		90.0	66.0	66.0					14.0	
Actuated g/C Ratio		1.00	0.73	0.73					0.16	
Clearance Time (s)			7.0	7.0					7.0	
Vehicle Extension (s)			2.0	2.0					3.0	
Lane Grp Cap (vph)		1611	2595	1161					434	
v/s Ratio Prot			c0.34						c0.07	
v/s Ratio Perm		0.12		0.32						
v/c Ratio		0.12	0.47	0.44					0.48	
Uniform Delay, d1		0.0	4.9	4.7					34.7	
Progression Factor		1.00	0.45	0.45					1.00	
Incremental Delay, d2		0.2	0.5	1.0					0.8	
Delay (s)		0.2	2.7	3.2					35.5	
Level of Service		A	A	A					D	
Approach Delay (s)	0.2		2.8			0.0	35.5			
Approach LOS	A		A			A	D			

### Intersection Summary

HCM Average Control Delay	5.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 102: Air Park Road & US 401 NB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	NBR2	SBL	SBT	NWL	NWR	NWR2
Lane Configurations										
Volume (vph)	0	244	1467	337	276	0	0	0	238	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0	5.0	5.0					5.0	
Lane Util. Factor		1.00	0.91	1.00					0.88	
Frt		0.86	1.00	0.85					0.85	
Flt Protected		1.00	1.00	1.00					1.00	
Satd. Flow (prot)		1611	5085	1583					2787	
Flt Permitted		1.00	1.00	1.00					1.00	
Satd. Flow (perm)		1611	5085	1583					2787	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	271	1630	374	307	0	0	0	264	18
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	271	1630	681	0	0	0	0	282	0
Turn Type		Free		Perm					custom	
Protected Phases			2						3	
Permitted Phases		Free		2						
Actuated Green, G (s)		90.0	62.6	62.6					13.4	
Effective Green, g (s)		90.0	64.6	64.6					15.4	
Actuated g/C Ratio		1.00	0.72	0.72					0.17	
Clearance Time (s)			7.0	7.0					7.0	
Vehicle Extension (s)			2.0	2.0					3.0	
Lane Grp Cap (vph)		1611	3650	1136					477	
v/s Ratio Prot			0.32						c0.10	
v/s Ratio Perm		0.17		c0.43						
v/c Ratio		0.17	0.45	0.60					0.59	
Uniform Delay, d1		0.0	5.3	6.3					34.4	
Progression Factor		1.00	0.54	0.58					1.00	
Incremental Delay, d2		0.2	0.3	2.0					2.0	
Delay (s)		0.2	3.2	5.6					36.4	
Level of Service		A	A	A					D	
Approach Delay (s)	0.2		3.9			0.0	36.4			
Approach LOS	A		A			A	D			

### Intersection Summary

HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 201: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↕↕
Volume (vph)	355	0	0	0	0	897
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	394	0	0	0	0	997
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	394	0	0	0	0	997
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	15.6					60.4
Effective Green, g (s)	17.6					62.4
Actuated g/C Ratio	0.20					0.69
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	671					2454
v/s Ratio Prot	c0.11					c0.28
v/s Ratio Perm						
v/c Ratio	0.59					0.41
Uniform Delay, d1	32.9					5.9
Progression Factor	0.82					1.00
Incremental Delay, d2	0.8					0.5
Delay (s)	27.8					6.4
Level of Service	C					A
Approach Delay (s)	27.8		0.0			6.4
Approach LOS	C		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			12.5		HCM Level of Service	B
HCM Volume to Capacity ratio			0.45			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			88.6%		ICU Level of Service	E
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM Signalized Intersection Capacity Analysis

## 201: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↑↑↑
Volume (vph)	478	0	0	0	0	1207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	531	0	0	0	0	1341
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	531	0	0	0	0	1341
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	19.4					56.6
Effective Green, g (s)	21.4					58.6
Actuated g/C Ratio	0.24					0.65
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	816					3311
v/s Ratio Prot	c0.15					c0.26
v/s Ratio Perm						
v/c Ratio	0.65					0.41
Uniform Delay, d1	30.9					7.4
Progression Factor	0.75					1.00
Incremental Delay, d2	1.1					0.4
Delay (s)	24.4					7.8
Level of Service	C					A
Approach Delay (s)	24.4		0.0			7.8
Approach LOS	C		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			12.5		HCM Level of Service	B
HCM Volume to Capacity ratio			0.47			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			83.9%		ICU Level of Service	E
Analysis Period (min)			15			
c	Critical Lane Group					



# HCM Signalized Intersection Capacity Analysis

## 201: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙↙					↘↘
Volume (vph)	301	0	0	0	0	1688
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	334	0	0	0	0	1876
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	334	0	0	0	0	1876
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	12.3					63.7
Effective Green, g (s)	14.3					65.7
Actuated g/C Ratio	0.16					0.73
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	545					2583
v/s Ratio Prot	c0.10					c0.53
v/s Ratio Perm						
v/c Ratio	0.61					0.73
Uniform Delay, d1	35.3					7.0
Progression Factor	0.92					1.00
Incremental Delay, d2	1.9					1.8
Delay (s)	34.5					8.8
Level of Service	C					A
Approach Delay (s)	34.5		0.0			8.8
Approach LOS	C		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			12.7		HCM Level of Service	B
HCM Volume to Capacity ratio			0.71			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			85.8%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 201: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙↘					↑↑↑
Volume (vph)	408	0	0	0	0	2273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	453	0	0	0	0	2526
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	453	0	0	0	0	2526
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	16.2					59.8
Effective Green, g (s)	18.2					61.8
Actuated g/C Ratio	0.20					0.69
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	694					3492
v/s Ratio Prot	c0.13					c0.50
v/s Ratio Perm						
v/c Ratio	0.65					0.72
Uniform Delay, d1	33.0					8.8
Progression Factor	1.09					1.00
Incremental Delay, d2	2.0					1.3
Delay (s)	38.0					10.1
Level of Service	D					B
Approach Delay (s)	38.0		0.0		10.1	
Approach LOS	D		A		B	

### Intersection Summary

HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# Reverse Superstreet Option

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↙			↑↑		
Volume (vph)	79	0	0	1623	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	88	0	0	1803	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	88	0	0	1803	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	7.2			38.8		
Effective Green, g (s)	9.2			40.8		
Actuated g/C Ratio	0.15			0.68		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	271			2407		
v/s Ratio Prot	c0.05			c0.51		
v/s Ratio Perm						
v/c Ratio	0.32			0.75		
Uniform Delay, d1	22.6			6.3		
Progression Factor	1.33			1.00		
Incremental Delay, d2	0.6			2.2		
Delay (s)	30.7			8.5		
Level of Service	C			A		
Approach Delay (s)	30.7			8.5	0.0	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶			↑↑↑		
Volume (vph)	105	0	0	2185	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	117	0	0	2428	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	117	0	0	2428	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	8.1			37.9		
Effective Green, g (s)	10.1			39.9		
Actuated g/C Ratio	0.17			0.66		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	298			3382		
v/s Ratio Prot	c0.07			c0.48		
v/s Ratio Perm						
v/c Ratio	0.39			0.72		
Uniform Delay, d1	22.2			6.4		
Progression Factor	1.45			1.00		
Incremental Delay, d2	0.8			1.3		
Delay (s)	33.0			7.8		
Level of Service	C			A		
Approach Delay (s)	33.0			7.8	0.0	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

6/6/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↵			↑↑		
Volume (vph)	200	0	0	867	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	222	0	0	963	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	222	0	0	963	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	12.6			33.4		
Effective Green, g (s)	14.6			35.4		
Actuated g/C Ratio	0.24			0.59		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	431			2088		
v/s Ratio Prot	c0.13			c0.27		
v/s Ratio Perm						
v/c Ratio	0.52			0.46		
Uniform Delay, d1	19.6			6.9		
Progression Factor	1.05			1.00		
Incremental Delay, d2	0.5			0.7		
Delay (s)	21.2			7.7		
Level of Service	C			A		
Approach Delay (s)	21.2			7.7	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰			↑↑↑		
Volume (vph)	269	0	0	1169	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.91		
Fr <sub>t</sub>	1.00			1.00		
Fl <sub>t</sub> Protected	0.95			1.00		
Satd. Flow (prot)	1770			5085		
Fl <sub>t</sub> Permitted	0.95			1.00		
Satd. Flow (perm)	1770			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	299	0	0	1299	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	299	0	0	1299	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	15.1			30.9		
Effective Green, g (s)	17.1			32.9		
Actuated g/C Ratio	0.29			0.55		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	504			2788		
v/s Ratio Prot	c0.17			c0.26		
v/s Ratio Perm						
v/c Ratio	0.59			0.47		
Uniform Delay, d <sub>1</sub>	18.5			8.2		
Progression Factor	1.23			1.00		
Incremental Delay, d <sub>2</sub>	0.9			0.6		
Delay (s)	23.7			8.8		
Level of Service	C			A		
Approach Delay (s)	23.7			8.8	0.0	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗								↑↑	↗	
Volume (vph)	0	307	3	0	0	0	0	0	0	0	779	474	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		5.0	5.0								5.0	5.0	
Lane Util. Factor		0.95	1.00								0.95	1.00	
Frt		1.00	0.85								1.00	0.85	
Flt Protected		1.00	1.00								1.00	1.00	
Satd. Flow (prot)		3539	1583								3539	1583	
Flt Permitted		1.00	1.00								1.00	1.00	
Satd. Flow (perm)		3539	1583								3539	1583	
Peak-hour factor, 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	
Adj. Flow (vph)	0	341	3	0	0	0	0	0	0	0	866	527	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	0	341	3	0	0	0	0	0	0	0	866	527	
Turn Type		custom					custom						
Protected Phases		7	9								6 8	7	
Permitted Phases			7									6 8	
Actuated Green, G (s)		13.0	32.7								62.3	75.3	
Effective Green, g (s)		15.0	36.7								66.3	81.3	
Actuated g/C Ratio		0.12	0.31								0.55	0.68	
Clearance Time (s)		7.0	7.0									7.0	
Vehicle Extension (s)		3.0	3.0									3.0	
Lane Grp Cap (vph)		442	484								1955	1204	
v/s Ratio Prot		c0.10	c0.00								0.24	c0.05	
v/s Ratio Perm			0.00									0.28	
v/c Ratio		0.77	0.01								0.44	0.44	
Uniform Delay, d1		50.8	29.0								15.9	8.9	
Progression Factor		1.00	1.00								0.98	0.62	
Incremental Delay, d2		8.1	0.0								0.1	0.2	
Delay (s)		59.0	29.0								15.7	5.7	
Level of Service		E	C								B	A	
Approach Delay (s)		58.7			0.0			0.0			11.9		
Approach LOS		E			A			A			B		
<b>Intersection Summary</b>													
HCM Average Control Delay			21.2		HCM Level of Service							C	
HCM Volume to Capacity ratio			0.41										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						15.0		
Intersection Capacity Utilization			38.4%		ICU Level of Service						A		
Analysis Period (min)			15										
c Critical Lane Group													



# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑								↑↑↑	↑↑
Volume (vph)	0	412	4	0	0	0	0	0	0	0	1048	637
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0								5.0	5.0
Lane Util. Factor		0.91	1.00								0.91	0.88
Frt		1.00	0.85								1.00	0.85
Flt Protected		1.00	1.00								1.00	1.00
Satd. Flow (prot)		5085	1583								5085	2787
Flt Permitted		1.00	1.00								1.00	1.00
Satd. Flow (perm)		5085	1583								5085	2787
Peak-hour factor, 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
Adj. Flow (vph)	0	458	4	0	0	0	0	0	0	0	1164	708
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	458	4	0	0	0	0	0	0	0	1164	708
Turn Type		custom					custom					
Protected Phases		7	9								6 8	7
Permitted Phases			7									6 8
Actuated Green, G (s)		12.0	36.9								58.1	70.1
Effective Green, g (s)		14.0	40.9								62.1	76.1
Actuated g/C Ratio		0.12	0.34								0.52	0.63
Clearance Time (s)		7.0	7.0									7.0
Vehicle Extension (s)		3.0	3.0									3.0
Lane Grp Cap (vph)		593	540								2631	2000
v/s Ratio Prot		c0.09	c0.00								c0.23	c0.04
v/s Ratio Perm			0.00									0.21
v/c Ratio		0.77	0.01								0.44	0.35
Uniform Delay, d1		51.5	26.1								18.1	10.4
Progression Factor		1.00	1.00								1.03	0.80
Incremental Delay, d2		6.2	0.0								0.1	0.1
Delay (s)		57.6	26.1								18.7	8.4
Level of Service		E	C								B	A
Approach Delay (s)		57.4			0.0			0.0			14.8	
Approach LOS		E			A			A			B	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.2		HCM Level of Service							C
HCM Volume to Capacity ratio			0.37									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						15.0	
Intersection Capacity Utilization			36.5%		ICU Level of Service						A	
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗								↑↑	↗	
Volume (vph)	0	476	29	0	0	0	0	0	0	0	1528	462	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		5.0	5.0								5.0	5.0	
Lane Util. Factor		0.95	1.00								0.95	1.00	
Frt		1.00	0.85								1.00	0.85	
Flt Protected		1.00	1.00								1.00	1.00	
Satd. Flow (prot)		3539	1583								3539	1583	
Flt Permitted		1.00	1.00								1.00	1.00	
Satd. Flow (perm)		3539	1583								3539	1583	
Peak-hour factor, 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	
Adj. Flow (vph)	0	529	32	0	0	0	0	0	0	0	1698	513	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	0	529	32	0	0	0	0	0	0	0	1698	513	
Turn Type		custom					custom						
Protected Phases		7	9								6	8	
Permitted Phases		7					6						
Actuated Green, G (s)		20.0	30.0								65.0	85.0	
Effective Green, g (s)		22.0	34.0								69.0	91.0	
Actuated g/C Ratio		0.18	0.28								0.58	0.76	
Clearance Time (s)		7.0	7.0									7.0	
Vehicle Extension (s)		3.0	3.0									3.0	
Lane Grp Cap (vph)		649	449								2035	1332	
v/s Ratio Prot		c0.15	c0.01								c0.48	0.07	
v/s Ratio Perm			0.01									0.25	
v/c Ratio		0.82	0.07								0.83	0.39	
Uniform Delay, d1		47.0	31.5								20.8	4.9	
Progression Factor		1.00	1.00								0.81	1.72	
Incremental Delay, d2		7.8	0.1								1.9	0.1	
Delay (s)		54.8	31.5								18.8	8.6	
Level of Service		D	C								B	A	
Approach Delay (s)		53.5			0.0			0.0			16.4		
Approach LOS		D			A			A			B		
<b>Intersection Summary</b>													
HCM Average Control Delay			23.9		HCM Level of Service							C	
HCM Volume to Capacity ratio			0.76										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						20.0		
Intersection Capacity Utilization			63.7%		ICU Level of Service						B		
Analysis Period (min)			15										
c Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑								↑↑↑	↑↑
Volume (vph)	0	641	39	0	0	0	0	0	0	0	2059	622
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0								5.0	5.0
Lane Util. Factor		0.91	1.00								0.91	0.88
Frt		1.00	0.85								1.00	0.85
Flt Protected		1.00	1.00								1.00	1.00
Satd. Flow (prot)		5085	1583								5085	2787
Flt Permitted		1.00	1.00								1.00	1.00
Satd. Flow (perm)		5085	1583								5085	2787
Peak-hour factor, 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
Adj. Flow (vph)	0	712	43	0	0	0	0	0	0	0	2288	691
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	712	43	0	0	0	0	0	0	0	2288	691
Turn Type		custom					custom					
Protected Phases		7	9								6 8	7
Permitted Phases		7					6 8					
Actuated Green, G (s)		22.0	35.0								60.0	82.0
Effective Green, g (s)		24.0	39.0								64.0	88.0
Actuated g/C Ratio		0.20	0.32								0.53	0.73
Clearance Time (s)		7.0	7.0									7.0
Vehicle Extension (s)		3.0	3.0									3.0
Lane Grp Cap (vph)		1017	514								2712	2276
v/s Ratio Prot		c0.14	c0.01								c0.45	0.06
v/s Ratio Perm			0.02									0.19
v/c Ratio		0.70	0.08								0.84	0.30
Uniform Delay, d1		44.7	28.1								23.8	5.5
Progression Factor		1.00	1.00								0.82	1.79
Incremental Delay, d2		2.2	0.1								1.6	0.0
Delay (s)		46.8	28.2								21.2	9.9
Level of Service		D	C								C	A
Approach Delay (s)		45.8			0.0			0.0			18.5	
Approach LOS		D			A			A			B	

### Intersection Summary

HCM Average Control Delay	24.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 102: Hilltop Needmore Road & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBR	NBT	NBR	NBR2	NWR	NWR2
Lane Configurations									
Volume (vph)	275	26	5	204	1580	68	53	334	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		2.0	5.0	5.0		5.0	
Lane Util. Factor	0.95	0.95		1.00	0.95	1.00		0.88	
Frt	1.00	0.99		0.86	1.00	0.85		0.85	
Flt Protected	0.95	0.96		1.00	1.00	1.00		1.00	
Satd. Flow (prot)	1681	1693		1611	3539	1583		2787	
Flt Permitted	0.95	0.96		1.00	1.00	1.00		1.00	
Satd. Flow (perm)	1681	1693		1611	3539	1583		2787	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	306	29	6	227	1756	76	59	371	19
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	171	170	0	227	1756	135	0	390	0
Turn Type	Split			Free		Perm		custom	
Protected Phases	7 8	7 8			2			9	
Permitted Phases				Free		2			
Actuated Green, G (s)	22.0	22.0		120.0	60.3	60.3		19.7	
Effective Green, g (s)	24.0	24.0		120.0	62.3	62.3		21.7	
Actuated g/C Ratio	0.20	0.20		1.00	0.52	0.52		0.18	
Clearance Time (s)					7.0	7.0		7.0	
Vehicle Extension (s)					2.0	2.0		3.0	
Lane Grp Cap (vph)	336	339		1611	1837	822		504	
v/s Ratio Prot	c0.10	0.10			c0.50			c0.14	
v/s Ratio Perm				0.14		0.09			
v/c Ratio	0.51	0.50		0.14	0.96	0.16		0.77	
Uniform Delay, d1	42.8	42.7		0.0	27.5	15.2		46.8	
Progression Factor	0.02	0.02		1.00	0.91	0.92		1.00	
Incremental Delay, d2	0.7	0.7		0.2	10.1	0.3		7.3	
Delay (s)	1.5	1.4		0.2	35.2	14.2		54.1	
Level of Service	A	A		A	D	B		D	
Approach Delay (s)		1.5			33.7				
Approach LOS		A			C				

Intersection Summary

HCM Average Control Delay	29.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	92.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 102: Hilltop Needmore Rd & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBR	NBT	NBR	NBR2	NWR	NWR2
Lane Configurations									
Volume (vph)	370	35	7	275	2128	92	70	451	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		2.0	5.0	5.0		5.0	
Lane Util. Factor	0.91	0.91		1.00	0.91	1.00		0.88	
Frt	1.00	0.99		0.86	1.00	0.85		0.85	
Flt Protected	0.95	0.97		1.00	1.00	1.00		1.00	
Satd. Flow (prot)	3221	1625		1611	5085	1583		2787	
Flt Permitted	0.95	0.97		1.00	1.00	1.00		1.00	
Satd. Flow (perm)	3221	1625		1611	5085	1583		2787	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	411	39	8	306	2364	102	78	501	26
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	304	154	0	306	2364	180	0	527	0
Turn Type	Split			Free		Perm		custom	
Protected Phases	7 8	7 8			2			9	
Permitted Phases				Free		2			
Actuated Green, G (s)	21.0	21.0		120.0	56.1	56.1		24.9	
Effective Green, g (s)	23.0	23.0		120.0	58.1	58.1		26.9	
Actuated g/C Ratio	0.19	0.19		1.00	0.48	0.48		0.22	
Clearance Time (s)					7.0	7.0		7.0	
Vehicle Extension (s)					2.0	2.0		3.0	
Lane Grp Cap (vph)	617	311		1611	2462	766		625	
v/s Ratio Prot	0.09	c0.09			c0.46			c0.19	
v/s Ratio Perm				0.19		0.11			
v/c Ratio	0.49	0.50		0.19	0.96	0.23		0.84	
Uniform Delay, d1	43.3	43.3		0.0	29.8	18.0		44.5	
Progression Factor	0.01	0.02		1.00	0.85	0.87		1.00	
Incremental Delay, d2	0.4	0.8		0.3	8.8	0.5		10.1	
Delay (s)	0.8	1.6		0.3	34.1	16.2		54.6	
Level of Service	A	A		A	C	B		D	
Approach Delay (s)		1.1			32.8				
Approach LOS		A			C				

### Intersection Summary

HCM Average Control Delay	29.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	98.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 102: Hilltop Needmore Road & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBR	NBT	NBR	NBR2	NWR	NWR2
Lane Configurations									
Volume (vph)	299	64	113	180	790	186	92	176	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		2.0	5.0	5.0		5.0	
Lane Util. Factor	0.95	0.95		1.00	0.95	1.00		0.88	
Frt	1.00	0.93		0.86	1.00	0.85		0.85	
Flt Protected	0.95	0.99		1.00	1.00	1.00		1.00	
Satd. Flow (prot)	1681	1621		1611	3539	1583		2787	
Flt Permitted	0.95	0.99		1.00	1.00	1.00		1.00	
Satd. Flow (perm)	1681	1621		1611	3539	1583		2787	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	332	71	126	200	878	207	102	196	13
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	272	257	0	200	878	309	0	209	0
Turn Type	Split			Free		Perm		custom	
Protected Phases	7 8	7 8			2			9	
Permitted Phases				Free		2			
Actuated Green, G (s)	29.0	29.0		120.0	63.0	63.0		10.0	
Effective Green, g (s)	31.0	31.0		120.0	65.0	65.0		12.0	
Actuated g/C Ratio	0.26	0.26		1.00	0.54	0.54		0.10	
Clearance Time (s)					7.0	7.0		7.0	
Vehicle Extension (s)					2.0	2.0		3.0	
Lane Grp Cap (vph)	434	419		1611	1917	857		279	
v/s Ratio Prot	c0.16	0.16			c0.25			c0.07	
v/s Ratio Perm				0.12		0.20			
v/c Ratio	0.63	0.61		0.12	0.46	0.36		0.75	
Uniform Delay, d1	39.4	39.2		0.0	16.8	15.7		52.5	
Progression Factor	0.05	0.04		1.00	0.96	0.94		1.00	
Incremental Delay, d2	1.6	1.5		0.2	0.7	1.1		10.5	
Delay (s)	3.5	3.1		0.2	16.8	15.8		63.0	
Level of Service	A	A		A	B	B		E	
Approach Delay (s)		3.3			16.5				
Approach LOS		A			B				

Intersection Summary

HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 102: Hilltop Needmore Rd & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBR	NBT	NBR	NBR2	NWR	NWR2
Lane Configurations									
Volume (vph)	403	86	152	244	1064	251	124	238	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		2.0	5.0	5.0		5.0	
Lane Util. Factor	0.91	0.91		1.00	0.91	1.00		0.88	
Frt	1.00	0.92		0.86	1.00	0.85		0.85	
Flt Protected	0.95	0.99		1.00	1.00	1.00		1.00	
Satd. Flow (prot)	3221	1545		1611	5085	1583		2787	
Flt Permitted	0.95	0.99		1.00	1.00	1.00		1.00	
Satd. Flow (perm)	3221	1545		1611	5085	1583		2787	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	448	96	169	271	1182	279	138	264	18
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	403	310	0	271	1182	417	0	282	0
Turn Type	Split			Free		Perm		custom	
Protected Phases	7 8	7 8			2			9	
Permitted Phases				Free		2			
Actuated Green, G (s)	31.0	31.0		120.0	58.0	58.0		13.0	
Effective Green, g (s)	33.0	33.0		120.0	60.0	60.0		15.0	
Actuated g/C Ratio	0.28	0.28		1.00	0.50	0.50		0.12	
Clearance Time (s)					7.0	7.0		7.0	
Vehicle Extension (s)					2.0	2.0		3.0	
Lane Grp Cap (vph)	886	425		1611	2543	792		348	
v/s Ratio Prot	0.13	c0.20			0.23			c0.10	
v/s Ratio Perm				0.17		c0.26			
v/c Ratio	0.45	0.73		0.17	0.46	0.53		0.81	
Uniform Delay, d1	36.0	39.5		0.0	19.5	20.4		51.1	
Progression Factor	0.00	0.10		1.00	0.97	0.95		1.00	
Incremental Delay, d2	0.3	4.4		0.2	0.6	2.3		13.3	
Delay (s)	0.3	8.5		0.2	19.5	21.6		64.4	
Level of Service	A	A		A	B	C		E	
Approach Delay (s)		3.9			20.0				
Approach LOS		A			C				

Intersection Summary

HCM Average Control Delay	18.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	72.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 201: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↕↕
Volume (vph)	355	0	0	0	0	897
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	394	0	0	0	0	997
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	394	0	0	0	0	997
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	11.8					34.2
Effective Green, g (s)	13.8					36.2
Actuated g/C Ratio	0.23					0.60
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	790					2135
v/s Ratio Prot	c0.11					c0.28
v/s Ratio Perm						
v/c Ratio	0.50					0.47
Uniform Delay, d1	20.1					6.6
Progression Factor	0.93					1.00
Incremental Delay, d2	0.3					0.7
Delay (s)	18.9					7.3
Level of Service	B					A
Approach Delay (s)	18.9		0.0			7.3
Approach LOS	B		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			10.6		HCM Level of Service	B
HCM Volume to Capacity ratio			0.48			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			88.6%		ICU Level of Service	E
Analysis Period (min)			15			
c	Critical Lane Group					



# HCM Signalized Intersection Capacity Analysis

## 201: North U-turn Median & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↑↑↑
Volume (vph)	478	0	0	0	0	1207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	531	0	0	0	0	1341
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	531	0	0	0	0	1341
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	14.3					31.7
Effective Green, g (s)	16.3					33.7
Actuated g/C Ratio	0.27					0.56
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	933					2856
v/s Ratio Prot	c0.15					c0.26
v/s Ratio Perm						
v/c Ratio	0.57					0.47
Uniform Delay, d1	18.8					7.8
Progression Factor	0.91					1.00
Incremental Delay, d2	0.4					0.6
Delay (s)	17.6					8.4
Level of Service	B					A
Approach Delay (s)	17.6		0.0		8.4	
Approach LOS	B		A		A	
<b>Intersection Summary</b>						
HCM Average Control Delay	11.0			HCM Level of Service		B
HCM Volume to Capacity ratio	0.50					
Actuated Cycle Length (s)	60.0			Sum of lost time (s)		10.0
Intersection Capacity Utilization	83.9%			ICU Level of Service		E
Analysis Period (min)	15					
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 201: North Median Break & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶↶					↷↷
Volume (vph)	301	0	0	0	0	1688
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	334	0	0	0	0	1876
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	334	0	0	0	0	1876
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	10.8					35.2
Effective Green, g (s)	12.8					37.2
Actuated g/C Ratio	0.21					0.62
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	732					2194
v/s Ratio Prot	c0.10					c0.53
v/s Ratio Perm						
v/c Ratio	0.46					0.86
Uniform Delay, d1	20.6					9.2
Progression Factor	0.93					1.00
Incremental Delay, d2	0.4					4.5
Delay (s)	19.4					13.7
Level of Service	B					B
Approach Delay (s)	19.4		0.0			13.7
Approach LOS	B		A			B
<b>Intersection Summary</b>						
HCM Average Control Delay			14.6		HCM Level of Service	B
HCM Volume to Capacity ratio			0.75			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			85.8%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 201: North U-turn Median & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↑↑↑
Volume (vph)	408	0	0	0	0	2273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	453	0	0	0	0	2526
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	453	0	0	0	0	2526
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	12.0					34.0
Effective Green, g (s)	14.0					36.0
Actuated g/C Ratio	0.23					0.60
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	801					3051
v/s Ratio Prot	c0.13					c0.50
v/s Ratio Perm						
v/c Ratio	0.57					0.83
Uniform Delay, d1	20.3					9.5
Progression Factor	1.00					1.00
Incremental Delay, d2	0.8					2.7
Delay (s)	21.1					12.3
Level of Service	C					B
Approach Delay (s)	21.1		0.0			12.3
Approach LOS	C		A			B
<b>Intersection Summary</b>						
HCM Average Control Delay			13.6		HCM Level of Service	B
HCM Volume to Capacity ratio			0.75			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			81.2%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

# Relocated Hilltop Road Option

# HCM Signalized Intersection Capacity Analysis

## 11: Lake Wheeler Road & US 401

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	5	276	16	191	145	178	1573	4	49	645	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, 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
Adj. Flow (vph)	34	6	307	18	212	161	198	1748	4	54	717	46
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	34	6	307	18	212	161	198	1748	4	54	717	46
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	9.8	17.2	40.2	7.2	14.6	21.6	23.0	60.6	67.8	7.0	44.6	54.4
Effective Green, g (s)	11.8	19.2	44.2	9.2	16.6	25.6	25.0	62.6	71.8	9.0	46.6	58.4
Actuated g/C Ratio	0.10	0.16	0.37	0.08	0.14	0.21	0.21	0.52	0.60	0.08	0.39	0.49
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	174	298	583	136	258	338	715	1846	1013	133	1374	836
v/s Ratio Prot	0.02	0.00	c0.11	0.01	c0.11	0.04	0.06	c0.49	0.00	0.03	c0.20	0.01
v/s Ratio Perm			0.08			0.07			0.00			0.02
v/c Ratio	0.20	0.02	0.53	0.13	0.82	0.48	0.28	0.95	0.00	0.41	0.52	0.06
Uniform Delay, d1	49.7	42.5	29.7	51.7	50.3	41.3	39.9	27.1	9.7	52.9	28.2	16.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.78	0.77	0.40
Incremental Delay, d2	0.6	0.0	0.9	0.4	18.6	1.1	0.2	11.7	0.0	1.9	1.4	0.0
Delay (s)	50.3	42.5	30.6	52.1	68.8	42.4	40.1	38.8	9.7	43.3	23.1	6.5
Level of Service	D	D	C	D	E	D	D	D	A	D	C	A
Approach Delay (s)		32.7			57.2			38.9			23.5	
Approach LOS		C			E			D			C	

























### Intersection Summary

HCM Average Control Delay	36.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 11: Lake Wheeler Road & US 401

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	7	372	22	257	195	240	2118	5	65	868	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	5085	1583	1770	5085	1583
Peak-hour factor, 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
Adj. Flow (vph)	46	8	413	24	286	217	267	2353	6	72	964	61
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	46	8	413	24	286	217	267	2353	6	72	964	61
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	9.8	14.2	39.2	15.0	19.4	26.4	25.0	55.8	70.8	7.0	37.8	47.6
Effective Green, g (s)	11.8	16.2	43.2	17.0	21.4	30.4	27.0	57.8	74.8	9.0	39.8	51.6
Actuated g/C Ratio	0.10	0.13	0.36	0.14	0.18	0.25	0.22	0.48	0.62	0.08	0.33	0.43
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	174	252	570	251	332	401	772	2449	1053	133	1687	747
v/s Ratio Prot	0.03	0.00	c0.16	0.01	c0.15	0.04	0.08	c0.46	0.00	0.04	c0.19	0.01
v/s Ratio Perm			0.10			0.10			0.00			0.03
v/c Ratio	0.26	0.03	0.72	0.10	0.86	0.54	0.35	0.96	0.01	0.54	0.57	0.08
Uniform Delay, d1	50.1	45.1	33.2	44.8	47.9	38.8	39.1	30.0	8.5	53.5	33.1	20.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.74	0.69	0.38
Incremental Delay, d2	0.8	0.1	4.6	0.2	19.8	1.5	0.3	11.1	0.0	4.2	1.3	0.0
Delay (s)	50.9	45.1	37.8	45.0	67.7	40.3	39.3	41.1	8.5	44.0	24.2	7.7
Level of Service	D	D	D	D	E	D	D	D	A	D	C	A
Approach Delay (s)		39.2			55.4			40.8			24.6	
Approach LOS		D			E			D			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			38.5			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			20.0			
Intersection Capacity Utilization			82.8%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 11: Lake Wheeler Road & US 401

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	113	198	7	104	78	273	801	17	149	1275	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, 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
Adj. Flow (vph)	22	126	220	8	116	87	303	890	19	166	1417	68
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	22	126	220	8	116	87	303	890	19	166	1417	68
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	7.0	14.4	29.4	4.2	11.6	27.0	15.0	58.0	62.2	15.4	58.4	65.4
Effective Green, g (s)	9.0	16.4	33.4	6.2	13.6	31.0	17.0	60.0	66.2	17.4	60.4	69.4
Actuated g/C Ratio	0.08	0.14	0.28	0.05	0.11	0.26	0.14	0.50	0.55	0.14	0.50	0.58
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	133	255	441	91	211	409	486	1770	939	257	1781	981
v/s Ratio Prot	0.01	0.07	c0.07	0.00	c0.06	0.03	c0.09	0.25	0.00	0.09	c0.40	0.01
v/s Ratio Perm			0.07			0.02			0.01			0.04
v/c Ratio	0.17	0.49	0.50	0.09	0.55	0.21	0.62	0.50	0.02	0.65	0.80	0.07
Uniform Delay, d1	52.0	48.0	36.3	54.2	50.3	34.9	48.5	20.0	12.2	48.4	24.7	11.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.43	0.11
Incremental Delay, d2	0.6	1.5	0.9	0.4	2.9	0.3	2.5	1.0	0.0	3.6	2.5	0.0
Delay (s)	52.6	49.5	37.2	54.6	53.2	35.2	51.0	21.1	12.2	48.1	13.1	1.2
Level of Service	D	D	D	D	D	D	D	C	B	D	B	A
Approach Delay (s)		42.3			45.8			28.4			16.1	
Approach LOS		D			D			C			B	

### Intersection Summary

HCM Average Control Delay	25.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 11: Lake Wheeler Road & US 401

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	152	266	9	140	105	368	1080	23	201	1718	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	3433	5085	1583	1770	5085	1583
Peak-hour factor, 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
Adj. Flow (vph)	30	169	296	10	156	117	409	1200	26	223	1909	91
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	30	169	296	10	156	117	409	1200	26	223	1909	91
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	9.9	19.2	36.2	4.2	13.5	32.5	17.0	49.6	53.8	19.0	51.6	61.5
Effective Green, g (s)	11.9	21.2	40.2	6.2	15.5	36.5	19.0	51.6	57.8	21.0	53.6	65.5
Actuated g/C Ratio	0.10	0.18	0.34	0.05	0.13	0.30	0.16	0.43	0.48	0.18	0.45	0.55
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	176	329	530	91	241	481	544	2187	828	310	2271	930
v/s Ratio Prot	0.02	0.09	c0.09	0.01	c0.08	0.04	c0.12	0.24	0.00	0.13	c0.38	0.01
v/s Ratio Perm			0.10			0.03			0.01			0.05
v/c Ratio	0.17	0.51	0.56	0.11	0.65	0.24	0.75	0.55	0.03	0.72	0.84	0.10
Uniform Delay, d1	49.5	44.7	32.6	54.3	49.7	31.4	48.2	25.5	16.4	46.7	29.4	13.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.37	0.22
Incremental Delay, d2	0.5	1.4	1.3	0.5	5.9	0.3	5.8	1.0	0.0	5.0	2.5	0.0
Delay (s)	50.0	46.1	33.9	54.8	55.5	31.6	54.1	26.5	16.4	47.1	13.4	2.9
Level of Service	D	D	C	D	E	C	D	C	B	D	B	A
Approach Delay (s)		39.0			45.6			33.2			16.4	
Approach LOS		D			D			C			B	

### Intersection Summary




























HCM Average Control Delay	26.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401

7/5/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	 							 			 		
Volume (vph)	294	28	1	59	204	145	16	1678	55	30	674	207	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583	
Peak-hour factor, 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	
Adj. Flow (vph)	327	31	1	66	227	161	18	1864	61	33	749	230	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	327	31	1	66	227	161	18	1864	61	33	749	230	
Turn Type	Prot		Prot	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	
Protected Phases	7	4	4	3	8	1	5	2	3	1	6	7	
Permitted Phases						8			2			6	
Actuated Green, G (s)	13.7	15.0	15.0	10.8	12.1	23.3	2.8	55.0	65.8	11.2	63.4	77.1	
Effective Green, g (s)	15.7	17.0	17.0	12.8	14.1	27.3	4.8	57.0	69.8	13.2	65.4	81.1	
Actuated g/C Ratio	0.13	0.14	0.14	0.11	0.12	0.23	0.04	0.48	0.58	0.11	0.55	0.68	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	449	264	224	189	219	360	71	1681	921	195	1929	1136	
v/s Ratio Prot	c0.10	c0.02	0.00	0.04	c0.12	0.05	0.01	c0.53	0.01	0.02	c0.21	0.03	
v/s Ratio Perm						0.05			0.03			0.12	
v/c Ratio	0.73	0.12	0.00	0.35	1.04	0.45	0.25	1.11	0.07	0.17	0.39	0.20	
Uniform Delay, d1	50.1	45.0	44.2	49.7	53.0	39.9	55.9	31.5	10.9	48.4	15.8	7.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.32	0.37	0.25	1.00	1.00	1.00	
Incremental Delay, d2	5.8	0.2	0.0	1.1	70.7	0.9	1.0	54.3	0.0	0.4	0.6	0.1	
Delay (s)	55.9	45.2	44.2	50.9	123.6	40.7	74.6	66.0	2.7	48.8	16.3	7.4	
Level of Service	E	D	D	D	F	D	E	E	A	D	B	A	
Approach Delay (s)		55.0			83.7			64.1			15.4		
Approach LOS		D			F			E			B		
<b>Intersection Summary</b>													
HCM Average Control Delay			52.5									HCM Level of Service	D
HCM Volume to Capacity ratio			0.95										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	20.0
Intersection Capacity Utilization			78.0%									ICU Level of Service	D
Analysis Period (min)			15										
c	Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑	↔	↔	↑↑	↔	↔	↑↑↑	↔	↔	↑↑↑	↔
Volume (vph)	370	35	2	79	257	195	20	2260	74	40	906	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	1770	3539	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	1770	3539	1583	1770	5085	1583	1770	5085	1583
Peak-hour factor, 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
Adj. Flow (vph)	411	39	2	88	286	217	22	2511	82	44	1007	289
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	411	39	2	88	286	217	22	2511	82	44	1007	289
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	14.0	9.0	13.2	18.8	13.8	24.6	4.2	53.4	72.2	10.8	60.0	74.0
Effective Green, g (s)	16.0	11.0	17.2	20.8	15.8	28.6	6.2	55.4	76.2	12.8	62.0	78.0
Actuated g/C Ratio	0.13	0.09	0.14	0.17	0.13	0.24	0.05	0.46	0.64	0.11	0.52	0.65
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	458	171	293	307	466	377	91	2348	1005	189	2627	1095
v/s Ratio Prot	c0.12	0.02	0.00	0.05	c0.08	c0.06	0.01	c0.49	0.01	0.02	0.20	0.04
v/s Ratio Perm			0.00			0.08			0.04			0.15
v/c Ratio	0.90	0.23	0.01	0.29	0.61	0.58	0.24	1.07	0.08	0.23	0.38	0.26
Uniform Delay, d1	51.2	50.6	44.1	43.1	49.2	40.3	54.6	32.3	8.4	49.1	17.5	8.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.25	0.50	0.28	1.00	1.00	1.00
Incremental Delay, d2	19.8	0.7	0.0	0.5	2.4	2.1	0.7	36.5	0.0	0.6	0.4	0.1
Delay (s)	71.0	51.2	44.1	43.7	51.6	42.5	69.3	52.5	2.4	49.7	17.9	9.0
Level of Service	E	D	D	D	D	D	E	D	A	D	B	A
Approach Delay (s)		69.2			47.1			51.1			17.0	
Approach LOS		E			D			D			B	




























### Intersection Summary

HCM Average Control Delay	43.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401

7/5/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	 							 			 		
Volume (vph)	299	64	14	80	104	78	29	797	72	51	1390	247	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583	
Peak-hour factor, 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	
Adj. Flow (vph)	332	71	16	89	116	87	32	886	80	57	1544	274	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	332	71	16	89	116	87	32	886	80	57	1544	274	
Turn Type	Prot		Prot	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	
Protected Phases	7	4	4	3	8	1	5	2	3	1	6	7	
Permitted Phases						8			2			6	
Actuated Green, G (s)	13.7	13.2	13.2	13.4	12.9	22.8	4.3	55.5	68.9	9.9	61.1	74.8	
Effective Green, g (s)	15.7	15.2	15.2	15.4	14.9	26.8	6.3	57.5	72.9	11.9	63.1	78.8	
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.12	0.22	0.05	0.48	0.61	0.10	0.53	0.66	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	449	236	201	227	231	354	93	1696	962	176	1861	1105	
v/s Ratio Prot	c0.10	0.04	0.01	0.05	c0.06	0.02	0.02	c0.25	0.01	0.03	c0.44	0.03	
v/s Ratio Perm						0.03			0.04			0.14	
v/c Ratio	0.74	0.30	0.08	0.39	0.50	0.25	0.34	0.52	0.08	0.32	0.83	0.25	
Uniform Delay, d1	50.2	47.6	46.2	48.0	49.1	38.3	54.9	21.7	9.7	50.3	23.9	8.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.05	0.40	0.28	1.00	1.00	1.00	
Incremental Delay, d2	6.3	0.7	0.2	1.1	1.7	0.4	2.0	1.1	0.0	1.1	4.5	0.1	
Delay (s)	56.5	48.3	46.4	49.1	50.8	38.7	59.8	9.8	2.7	51.4	28.4	8.6	
Level of Service	E	D	D	D	D	D	E	A	A	D	C	A	
Approach Delay (s)		54.7			46.7			10.9			26.2		
Approach LOS		D			D			B			C		
<b>Intersection Summary</b>													
HCM Average Control Delay			26.9									HCM Level of Service	C
HCM Volume to Capacity ratio			0.76										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	20.0
Intersection Capacity Utilization			65.9%									ICU Level of Service	C
Analysis Period (min)			15										
c	Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	403	86	20	109	140	105	39	1075	98	69	1872	333
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583	1770	3539	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583	1770	3539	1583	1770	5085	1583	1770	5085	1583
Peak-hour factor, 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
Adj. Flow (vph)	448	96	22	121	156	117	43	1194	109	77	2080	370
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	448	96	22	121	156	117	43	1194	109	77	2080	370
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Actuated Green, G (s)	19.5	15.4	21.0	11.7	7.6	18.0	5.6	54.5	66.2	10.4	59.3	78.8
Effective Green, g (s)	21.5	17.4	25.0	13.7	9.6	22.0	7.6	56.5	70.2	12.4	61.3	82.8
Actuated g/C Ratio	0.18	0.14	0.21	0.11	0.08	0.18	0.06	0.47	0.59	0.10	0.51	0.69
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	615	270	396	202	283	290	112	2394	926	183	2598	1158
v/s Ratio Prot	c0.13	0.05	0.00	0.07	c0.04	0.04	0.02	c0.23	0.01	0.04	c0.41	0.06
v/s Ratio Perm			0.01			0.03			0.06			0.18
v/c Ratio	0.73	0.36	0.06	0.60	0.55	0.40	0.38	0.50	0.12	0.42	0.80	0.32
Uniform Delay, d1	46.5	46.2	38.0	50.5	53.1	43.2	54.0	22.0	11.1	50.4	24.3	7.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.01	0.35	0.28	1.00	1.00	1.00
Incremental Delay, d2	4.3	0.8	0.1	4.7	2.3	0.9	1.9	0.7	0.1	1.6	2.7	0.2
Delay (s)	50.8	47.1	38.1	55.3	55.4	44.1	56.6	8.3	3.2	52.0	27.0	7.6
Level of Service	D	D	D	E	E	D	E	A	A	D	C	A
Approach Delay (s)		49.7			52.0			9.4			24.9	
Approach LOS		D			D			A			C	

### Intersection Summary

HCM Average Control Delay	25.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# **Reverse Superstreet and Relocated Hilltop Road with No Direct Left Turns**

# HCM Signalized Intersection Capacity Analysis

## 22: U-turn S of LW & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	82	0	0	1722	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	91	0	0	1913	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	91	0	0	1913	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	8.6			67.4		
Effective Green, g (s)	10.6			69.4		
Actuated g/C Ratio	0.12			0.77		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	208			2729		
v/s Ratio Prot	c0.05			c0.54		
v/s Ratio Perm						
v/c Ratio	0.44			0.70		
Uniform Delay, d1	36.9			5.1		
Progression Factor	1.12			1.00		
Incremental Delay, d2	1.4			1.5		
Delay (s)	42.8			6.7		
Level of Service	D			A		
Approach Delay (s)	42.8			6.7	0.0	
Approach LOS	D			A	A	

### Intersection Summary

HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 22: U-turn S of LW & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	109	0	0	2372	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	121	0	0	2636	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	121	0	0	2636	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	8.2			37.8		
Effective Green, g (s)	10.2			39.8		
Actuated g/C Ratio	0.17			0.66		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	301			3373		
v/s Ratio Prot	c0.07			c0.52		
v/s Ratio Perm						
v/c Ratio	0.40			0.78		
Uniform Delay, d1	22.2			7.1		
Progression Factor	0.89			1.00		
Incremental Delay, d2	0.8			1.9		
Delay (s)	20.5			8.9		
Level of Service	C			A		
Approach Delay (s)	20.5			8.9		0.0
Approach LOS	C			A		A

Intersection Summary			
HCM Average Control Delay	9.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 22: U-turn S of LW & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶			↷		
Volume (vph)	226	0	0	1067	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	251	0	0	1186	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	251	0	0	1186	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	13.0			33.0		
Effective Green, g (s)	15.0			35.0		
Actuated g/C Ratio	0.25			0.58		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	443			2064		
v/s Ratio Prot	c0.14			c0.34		
v/s Ratio Perm						
v/c Ratio	0.57			0.57		
Uniform Delay, d1	19.7			7.8		
Progression Factor	0.73			1.00		
Incremental Delay, d2	1.1			1.2		
Delay (s)	15.5			9.0		
Level of Service	B			A		
Approach Delay (s)	15.5			9.0	0.0	
Approach LOS	B			A	A	

### Intersection Summary

HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



# HCM Signalized Intersection Capacity Analysis

## 22: U-turn S of LW & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶			↷↷↷		
Volume (vph)	304	0	0	1439	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	338	0	0	1599	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	338	0	0	1599	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	16.0			30.0		
Effective Green, g (s)	18.0			32.0		
Actuated g/C Ratio	0.30			0.53		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	531			2712		
v/s Ratio Prot	c0.19			c0.31		
v/s Ratio Perm						
v/c Ratio	0.64			0.59		
Uniform Delay, d1	18.2			9.5		
Progression Factor	0.96			1.00		
Incremental Delay, d2	1.7			0.9		
Delay (s)	19.2			10.5		
Level of Service	B			B		
Approach Delay (s)	19.2			10.5	0.0	
Approach LOS	B			B	A	

### Intersection Summary

HCM Average Control Delay	12.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 31: Lake Wheeler Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↗			↕↕	↘
Volume (vph)	0	308	0	0	713	394
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0
Lane Util. Factor		0.88			0.95	1.00
Frt		0.85			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		2787			3539	1583
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		2787			3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	342	0	0	792	438
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	342	0	0	792	438
Turn Type		custom				custom
Protected Phases		4			6	
Permitted Phases						6 4
Actuated Green, G (s)		17.0			59.0	90.0
Effective Green, g (s)		19.0			61.0	90.0
Actuated g/C Ratio		0.21			0.68	1.00
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		588			2399	1583
v/s Ratio Prot		c0.12			c0.22	
v/s Ratio Perm						0.28
v/c Ratio		0.58			0.33	0.28
Uniform Delay, d1		31.9			6.0	0.0
Progression Factor		1.00			0.51	1.00
Incremental Delay, d2		1.5			0.3	0.1
Delay (s)		33.4			3.4	0.1
Level of Service		C			A	A
Approach Delay (s)	33.4			0.0	2.2	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 31: Lake Wheeler Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↑↑			↑↑↑	↑
Volume (vph)	0	415	0	0	960	531
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0
Lane Util. Factor		0.88			0.91	1.00
Frt		0.85			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		2787			5085	1583
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		2787			5085	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	461	0	0	1067	590
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	461	0	0	1067	590
Turn Type		custom				custom
Protected Phases		4			6	
Permitted Phases						6 4
Actuated Green, G (s)		16.0			30.0	60.0
Effective Green, g (s)		18.0			32.0	60.0
Actuated g/C Ratio		0.30			0.53	1.00
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		836			2712	1583
v/s Ratio Prot		c0.17			0.21	
v/s Ratio Perm						c0.37
v/c Ratio		0.55			0.39	0.37
Uniform Delay, d1		17.6			8.3	0.0
Progression Factor		1.00			0.55	1.00
Incremental Delay, d2		0.8			0.4	0.1
Delay (s)		18.4			4.9	0.1
Level of Service		B			A	A
Approach Delay (s)	18.4			0.0	3.2	
Approach LOS	B			A	A	

### Intersection Summary

HCM Average Control Delay	6.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	5.0
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 31: Lake Wheeler Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↑↑			↑↑	↑
Volume (vph)	0	260	0	0	1501	409
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0
Lane Util. Factor		0.88			0.95	1.00
Frt		0.85			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		2787			3539	1583
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		2787			3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	289	0	0	1668	454
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	289	0	0	1668	454
Turn Type		custom			custom	
Protected Phases		4			6	
Permitted Phases						6 4
Actuated Green, G (s)		11.1			34.9	60.0
Effective Green, g (s)		13.1			36.9	60.0
Actuated g/C Ratio		0.22			0.61	1.00
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		608			2176	1583
v/s Ratio Prot		c0.10			c0.47	
v/s Ratio Perm						0.29
v/c Ratio		0.48			0.77	0.29
Uniform Delay, d1		20.5			8.4	0.0
Progression Factor		1.00			0.36	1.00
Incremental Delay, d2		0.6			1.3	0.0
Delay (s)		21.0			4.3	0.0
Level of Service		C			A	A
Approach Delay (s)	21.0			0.0	3.4	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 31: Lake Wheeler Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↗			↕↕↕	↘
Volume (vph)	0	350	0	0	2024	551
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0
Lane Util. Factor		0.88			0.91	1.00
Frt		0.85			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		2787			5085	1583
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		2787			5085	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	389	0	0	2249	612
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	389	0	0	2249	612
Turn Type		custom			custom	
Protected Phases		4			6	
Permitted Phases						6 4
Actuated Green, G (s)		12.2			33.8	60.0
Effective Green, g (s)		14.2			35.8	60.0
Actuated g/C Ratio		0.24			0.60	1.00
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		660			3034	1583
v/s Ratio Prot		c0.14			c0.44	
v/s Ratio Perm						0.39
v/c Ratio		0.59			0.74	0.39
Uniform Delay, d1		20.3			8.8	0.0
Progression Factor		1.00			0.27	1.00
Incremental Delay, d2		1.4			0.7	0.1
Delay (s)		21.7			3.0	0.1
Level of Service		C			A	A
Approach Delay (s)	21.7			0.0	2.4	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	4.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 32: Relocated Hilltop Rd & US 401 NB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↔↔	↕↕	↗		
Volume (vph)	0	351	1751	53	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0		
Lane Util. Factor		0.88	0.95	1.00		
Frt		0.85	1.00	0.85		
Flt Protected		1.00	1.00	1.00		
Satd. Flow (prot)		2787	3539	1583		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		2787	3539	1583		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	390	1946	59	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	390	1946	59	0	0
Turn Type		custom		custom		
Protected Phases		8	2			
Permitted Phases				2 8		
Actuated Green, G (s)		15.9	60.1	90.0		
Effective Green, g (s)		17.9	62.1	90.0		
Actuated g/C Ratio		0.20	0.69	1.00		
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		554	2442	1583		
v/s Ratio Prot		c0.14	c0.55			
v/s Ratio Perm				0.04		
v/c Ratio		0.70	0.80	0.04		
Uniform Delay, d1		33.6	9.6	0.0		
Progression Factor		1.00	0.54	1.00		
Incremental Delay, d2		4.0	2.1	0.0		
Delay (s)		37.6	7.2	0.0		
Level of Service		D	A	A		
Approach Delay (s)	37.6		7.0		0.0	
Approach LOS	D		A		A	

Intersection Summary			
HCM Average Control Delay		12.0	HCM Level of Service B
HCM Volume to Capacity ratio		0.78	
Actuated Cycle Length (s)		90.0	Sum of lost time (s) 10.0
Intersection Capacity Utilization		69.0%	ICU Level of Service C
Analysis Period (min)		15	
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 32: Relocated Hilltop Rd & US 401 NB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗↗	↑↑↑	↘		
Volume (vph)	0	474	2358	123	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0		
Lane Util. Factor		0.88	0.91	1.00		
Frt		0.85	1.00	0.85		
Flt Protected		1.00	1.00	1.00		
Satd. Flow (prot)		2787	5085	1583		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		2787	5085	1583		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	527	2620	137	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	527	2620	137	0	0
Turn Type		custom		custom		
Protected Phases		8	2			
Permitted Phases				2 8		
Actuated Green, G (s)		12.8	33.2	60.0		
Effective Green, g (s)		14.8	35.2	60.0		
Actuated g/C Ratio		0.25	0.59	1.00		
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		687	2983	1583		
v/s Ratio Prot		c0.19	c0.52			
v/s Ratio Perm				0.09		
v/c Ratio		0.77	0.88	0.09		
Uniform Delay, d1		21.0	10.6	0.0		
Progression Factor		1.00	0.40	1.00		
Incremental Delay, d2		5.1	2.8	0.0		
Delay (s)		26.1	7.1	0.0		
Level of Service		C	A	A		
Approach Delay (s)	26.1		6.7		0.0	
Approach LOS	C		A		A	

Intersection Summary			
HCM Average Control Delay		9.8	HCM Level of Service A
HCM Volume to Capacity ratio		0.85	
Actuated Cycle Length (s)		60.0	Sum of lost time (s) 10.0
Intersection Capacity Utilization		70.5%	ICU Level of Service C
Analysis Period (min)		15	
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 32: Relocated Hilltop Rd & US 401 NB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↖↖	↕↕	↗		
Volume (vph)	0	188	1043	250	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0		
Lane Util. Factor		0.88	0.95	1.00		
Frt		0.85	1.00	0.85		
Flt Protected		1.00	1.00	1.00		
Satd. Flow (prot)		2787	3539	1583		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		2787	3539	1583		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	209	1159	278	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	209	1159	278	0	0
Turn Type		custom		custom		
Protected Phases		8	2			
Permitted Phases				2 8		
Actuated Green, G (s)		10.0	36.0	60.0		
Effective Green, g (s)		12.0	38.0	60.0		
Actuated g/C Ratio		0.20	0.63	1.00		
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		557	2241	1583		
v/s Ratio Prot		c0.07	c0.33			
v/s Ratio Perm				0.18		
v/c Ratio		0.38	0.52	0.18		
Uniform Delay, d1		20.8	6.0	0.0		
Progression Factor		1.00	0.60	1.00		
Incremental Delay, d2		0.4	0.7	0.0		
Delay (s)		21.2	4.3	0.0		
Level of Service		C	A	A		
Approach Delay (s)	21.2		3.5		0.0	
Approach LOS	C		A		A	

Intersection Summary			
HCM Average Control Delay		5.7	HCM Level of Service A
HCM Volume to Capacity ratio		0.48	
Actuated Cycle Length (s)		60.0	Sum of lost time (s) 10.0
Intersection Capacity Utilization		43.7%	ICU Level of Service A
Analysis Period (min)		15	
c Critical Lane Group			



# HCM Signalized Intersection Capacity Analysis

## 32: Relocated Hilltop Rd & US 401 NB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗↘	↑↑↑	↗		
Volume (vph)	0	255	1406	337	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0		
Lane Util. Factor		0.88	0.91	1.00		
Frt		0.85	1.00	0.85		
Flt Protected		1.00	1.00	1.00		
Satd. Flow (prot)		2787	5085	1583		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		2787	5085	1583		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	283	1562	374	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	283	1562	374	0	0
Turn Type		custom		custom		
Protected Phases		8	2			
Permitted Phases				2 8		
Actuated Green, G (s)		11.6	34.4	60.0		
Effective Green, g (s)		13.6	36.4	60.0		
Actuated g/C Ratio		0.23	0.61	1.00		
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		632	3085	1583		
v/s Ratio Prot		c0.10	c0.31			
v/s Ratio Perm				0.24		
v/c Ratio		0.45	0.51	0.24		
Uniform Delay, d1		20.0	6.7	0.0		
Progression Factor		1.00	0.39	1.00		
Incremental Delay, d2		0.5	0.5	0.1		
Delay (s)		20.5	3.1	0.1		
Level of Service		C	A	A		
Approach Delay (s)	20.5		2.5		0.0	
Approach LOS	C		A		A	

### Intersection Summary

HCM Average Control Delay	4.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 41: U-turn N of LW & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶					↷↷
Volume (vph)	369	0	0	0	0	738
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1770					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1770					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	410	0	0	0	0	820
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	410	0	0	0	0	820
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	26.8					49.2
Effective Green, g (s)	28.8					51.2
Actuated g/C Ratio	0.32					0.57
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	566					2013
v/s Ratio Prot	c0.23					c0.23
v/s Ratio Perm						
v/c Ratio	0.72					0.41
Uniform Delay, d1	27.1					10.9
Progression Factor	0.78					0.54
Incremental Delay, d2	2.8					0.6
Delay (s)	24.0					6.5
Level of Service	C					A
Approach Delay (s)	24.0		0.0			6.5
Approach LOS	C		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			12.3		HCM Level of Service	B
HCM Volume to Capacity ratio			0.52			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			75.8%		ICU Level of Service	D
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM Signalized Intersection Capacity Analysis

## 41: U-turn N of LW & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖					↑↑↑
Volume (vph)	498	0	0	0	0	993
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1770					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1770					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	553	0	0	0	0	1103
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	553	0	0	0	0	1103
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	23.3					22.7
Effective Green, g (s)	25.3					24.7
Actuated g/C Ratio	0.42					0.41
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	746					2093
v/s Ratio Prot	c0.31					c0.22
v/s Ratio Perm						
v/c Ratio	0.74					0.53
Uniform Delay, d1	14.6					13.3
Progression Factor	0.54					0.59
Incremental Delay, d2	2.0					0.9
Delay (s)	9.8					8.7
Level of Service	A					A
Approach Delay (s)	9.8		0.0			8.7
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 41: U-turn N of LW & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶					↷↷
Volume (vph)	355	0	0	0	0	1555
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1770					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1770					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	394	0	0	0	0	1728
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	394	0	0	0	0	1728
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	14.5					31.5
Effective Green, g (s)	16.5					33.5
Actuated g/C Ratio	0.28					0.56
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	487					1976
v/s Ratio Prot	c0.22					c0.49
v/s Ratio Perm						
v/c Ratio	0.81					0.87
Uniform Delay, d1	20.3					11.4
Progression Factor	0.79					0.36
Incremental Delay, d2	8.6					4.0
Delay (s)	24.7					8.0
Level of Service	C					A
Approach Delay (s)	24.7		0.0			8.0
Approach LOS	C		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			11.1		HCM Level of Service	B
HCM Volume to Capacity ratio			0.85			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			74.7%		ICU Level of Service	D
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM Signalized Intersection Capacity Analysis

## 41: U-turn N of LW & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖					↑↑↑
Volume (vph)	478	0	0	0	0	2096
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1770					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1770					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	531	0	0	0	0	2329
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	531	0	0	0	0	2329
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	17.9					28.1
Effective Green, g (s)	19.9					30.1
Actuated g/C Ratio	0.33					0.50
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	587					2551
v/s Ratio Prot	c0.30					c0.46
v/s Ratio Perm						
v/c Ratio	0.90					0.91
Uniform Delay, d1	19.1					13.7
Progression Factor	0.66					0.36
Incremental Delay, d2	15.9					4.8
Delay (s)	28.6					9.8
Level of Service	C					A
Approach Delay (s)	28.6		0.0			9.8
Approach LOS	C		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			13.3		HCM Level of Service	B
HCM Volume to Capacity ratio			0.91			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			74.5%		ICU Level of Service	D
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↙			↑↑		
Volume (vph)	30	0	0	1733	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	33	0	0	1926	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	33	0	0	1926	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	4.9			71.1		
Effective Green, g (s)	6.9			73.1		
Actuated g/C Ratio	0.08			0.81		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	136			2874		
v/s Ratio Prot	c0.02			c0.54		
v/s Ratio Perm						
v/c Ratio	0.24			0.67		
Uniform Delay, d1	39.1			3.5		
Progression Factor	0.88			0.37		
Incremental Delay, d2	0.9			0.8		
Delay (s)	35.2			2.1		
Level of Service	D			A		
Approach Delay (s)	35.2			2.1	0.0	
Approach LOS	D			A	A	

### Intersection Summary

HCM Average Control Delay	2.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰			↑↑↑		
Volume (vph)	40	0	0	2334	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	44	0	0	2593	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	44	0	0	2593	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	3.3			42.7		
Effective Green, g (s)	5.3			44.7		
Actuated g/C Ratio	0.09			0.75		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	156			3788		
v/s Ratio Prot	c0.02			c0.51		
v/s Ratio Perm						
v/c Ratio	0.28			0.68		
Uniform Delay, d1	25.6			4.0		
Progression Factor	0.74			0.26		
Incremental Delay, d2	1.0			0.5		
Delay (s)	19.8			1.5		
Level of Service	B			A		
Approach Delay (s)	19.8			1.5	0.0	
Approach LOS	B			A	A	

### Intersection Summary

HCM Average Control Delay	1.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	51	0	0	876	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	57	0	0	973	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	57	0	0	973	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	5.1			40.9		
Effective Green, g (s)	7.1			42.9		
Actuated g/C Ratio	0.12			0.71		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	209			2530		
v/s Ratio Prot	c0.03			c0.27		
v/s Ratio Perm						
v/c Ratio	0.27			0.38		
Uniform Delay, d1	24.1			3.4		
Progression Factor	0.69			0.44		
Incremental Delay, d2	0.5			0.4		
Delay (s)	17.1			1.9		
Level of Service	B			A		
Approach Delay (s)	17.1			1.9	0.0	
Approach LOS	B			A	A	

### Intersection Summary

HCM Average Control Delay	2.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↙			↑↑↑		
Volume (vph)	69	0	0	1183	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	77	0	0	1314	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	77	0	0	1314	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	5.6			40.4		
Effective Green, g (s)	7.6			42.4		
Actuated g/C Ratio	0.13			0.71		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	224			3593		
v/s Ratio Prot	c0.04			c0.26		
v/s Ratio Perm						
v/c Ratio	0.34			0.37		
Uniform Delay, d1	23.9			3.5		
Progression Factor	0.59			0.42		
Incremental Delay, d2	0.7			0.3		
Delay (s)	14.9			1.7		
Level of Service	B			A		
Approach Delay (s)	14.9			1.7		0.0
Approach LOS	B			A		A

### Intersection Summary

HCM Average Control Delay	2.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑								↑↑	↑↑
Volume (vph)	0	301	5	0	0	0	0	0	0	0	763	283
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0								5.0	5.0
Lane Util. Factor		0.95	1.00								0.95	0.88
Frt		1.00	0.85								1.00	0.85
Flt Protected		1.00	1.00								1.00	1.00
Satd. Flow (prot)		3539	1583								3539	2787
Flt Permitted		1.00	1.00								1.00	1.00
Satd. Flow (perm)		3539	1583								3539	2787
Peak-hour factor, 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
Adj. Flow (vph)	0	334	6	0	0	0	0	0	0	0	848	314
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	334	6	0	0	0	0	0	0	0	848	314
Turn Type			Perm									custom
Protected Phases		7									6 8	7
Permitted Phases			7									6 8
Actuated Green, G (s)		11.8	11.8								64.2	76.0
Effective Green, g (s)		13.8	13.8								64.2	78.0
Actuated g/C Ratio		0.15	0.15								0.71	0.87
Clearance Time (s)		7.0	7.0									7.0
Vehicle Extension (s)		3.0	3.0									3.0
Lane Grp Cap (vph)		543	243								2524	2725
v/s Ratio Prot		c0.09									c0.24	0.02
v/s Ratio Perm			0.00									0.10
v/c Ratio		0.62	0.02								0.34	0.12
Uniform Delay, d1		35.6	32.4								4.9	0.9
Progression Factor		1.00	1.00								0.79	1.00
Incremental Delay, d2		2.1	0.0								0.1	0.0
Delay (s)		37.7	32.4								3.9	0.9
Level of Service		D	C								A	A
Approach Delay (s)		37.6			0.0			0.0			3.1	
Approach LOS		D			A			A			A	

### Intersection Summary

HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑								↑↑↑	↑↑
Volume (vph)	0	405	7	0	0	0	0	0	0	0	1026	380
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0								5.0	5.0
Lane Util. Factor		0.91	1.00								0.91	0.88
Frt		1.00	0.85								1.00	0.85
Flt Protected		1.00	1.00								1.00	1.00
Satd. Flow (prot)		5085	1583								5085	2787
Flt Permitted		1.00	1.00								1.00	1.00
Satd. Flow (perm)		5085	1583								5085	2787
Peak-hour factor, 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
Adj. Flow (vph)	0	450	8	0	0	0	0	0	0	0	1140	422
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	450	8	0	0	0	0	0	0	0	1140	422
Turn Type			Perm									custom
Protected Phases		7									6 8	7
Permitted Phases			7									6 8
Actuated Green, G (s)		7.0	7.0								39.0	46.0
Effective Green, g (s)		9.0	9.0								39.0	48.0
Actuated g/C Ratio		0.15	0.15								0.65	0.80
Clearance Time (s)		7.0	7.0									7.0
Vehicle Extension (s)		3.0	3.0									3.0
Lane Grp Cap (vph)		763	237								3305	2694
v/s Ratio Prot		c0.09									c0.22	0.02
v/s Ratio Perm			0.01									0.13
v/c Ratio		0.59	0.03								0.34	0.16
Uniform Delay, d1		23.8	21.8								4.7	1.4
Progression Factor		1.00	1.00								0.54	1.00
Incremental Delay, d2		1.2	0.1								0.1	0.0
Delay (s)		25.0	21.8								2.6	1.4
Level of Service		C	C								A	A
Approach Delay (s)		24.9			0.0			0.0			2.3	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	7.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗								↑↑	↗↘
Volume (vph)	0	363	86	0	0	0	0	0	0	0	1521	358
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0								5.0	5.0
Lane Util. Factor		0.95	1.00								0.95	0.88
Frt		1.00	0.85								1.00	0.85
Flt Protected		1.00	1.00								1.00	1.00
Satd. Flow (prot)		3539	1583								3539	2787
Flt Permitted		1.00	1.00								1.00	1.00
Satd. Flow (perm)		3539	1583								3539	2787
Peak-hour factor, 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
Adj. Flow (vph)	0	403	96	0	0	0	0	0	0	0	1690	398
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	403	96	0	0	0	0	0	0	0	1690	398
Turn Type			Perm									custom
Protected Phases		7									6 8	7
Permitted Phases			7									6 8
Actuated Green, G (s)		9.9	9.9								36.1	46.0
Effective Green, g (s)		11.9	11.9								36.1	48.0
Actuated g/C Ratio		0.20	0.20								0.60	0.80
Clearance Time (s)		7.0	7.0									7.0
Vehicle Extension (s)		3.0	3.0									3.0
Lane Grp Cap (vph)		702	314								2129	2694
v/s Ratio Prot		c0.11									c0.48	0.03
v/s Ratio Perm			0.06									0.11
v/c Ratio		0.57	0.31								0.79	0.15
Uniform Delay, d1		21.8	20.5								9.1	1.4
Progression Factor		1.00	1.00								0.44	1.00
Incremental Delay, d2		1.1	0.6								1.3	0.0
Delay (s)		22.9	21.1								5.4	1.4
Level of Service		C	C								A	A
Approach Delay (s)		22.5			0.0			0.0			4.6	
Approach LOS		C			A			A			A	

### Intersection Summary

HCM Average Control Delay	8.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

6/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑								↑↑↑	↑↑
Volume (vph)	0	489	115	0	0	0	0	0	0	0	2050	482
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0								5.0	5.0
Lane Util. Factor		0.91	1.00								0.91	0.88
Frt		1.00	0.85								1.00	0.85
Flt Protected		1.00	1.00								1.00	1.00
Satd. Flow (prot)		5085	1583								5085	2787
Flt Permitted		1.00	1.00								1.00	1.00
Satd. Flow (perm)		5085	1583								5085	2787
Peak-hour factor, 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
Adj. Flow (vph)	0	543	128	0	0	0	0	0	0	0	2278	536
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	543	128	0	0	0	0	0	0	0	2278	536
Turn Type			Perm									custom
Protected Phases		7									6 8	7
Permitted Phases			7									6 8
Actuated Green, G (s)		20.0	20.0								56.0	76.0
Effective Green, g (s)		22.0	22.0								56.0	78.0
Actuated g/C Ratio		0.24	0.24								0.62	0.87
Clearance Time (s)		7.0	7.0									7.0
Vehicle Extension (s)		3.0	3.0									3.0
Lane Grp Cap (vph)		1243	387								3164	2725
v/s Ratio Prot		c0.11									c0.45	0.05
v/s Ratio Perm			0.08									0.14
v/c Ratio		0.44	0.33								0.72	0.20
Uniform Delay, d1		28.8	27.9								11.6	1.0
Progression Factor		1.00	1.00								0.66	1.00
Incremental Delay, d2		0.2	0.5								0.6	0.0
Delay (s)		29.0	28.5								8.3	1.0
Level of Service		C	C								A	A
Approach Delay (s)		28.9			0.0			0.0			6.9	
Approach LOS		C			A			A			A	

### Intersection Summary

HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 102: Hilltop Needmore Rd & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	275	26	0	0	0	204	0	1708	55	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				2.0		5.0	5.0			
Lane Util. Factor	0.95	0.95				1.00		0.95	1.00			
Frt	1.00	1.00				0.86		1.00	0.85			
Flt Protected	0.95	0.96				1.00		1.00	1.00			
Satd. Flow (prot)	1681	1699				1611		3539	1583			
Flt Permitted	0.95	0.96				1.00		1.00	1.00			
Satd. Flow (perm)	1681	1699				1611		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	306	29	0	0	0	227	0	1898	61	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	168	167	0	0	0	227	0	1898	61	0	0	0
Turn Type	Split					Free		Perm				
Protected Phases	7 8	7 8						2				
Permitted Phases						Free		2				
Actuated Green, G (s)	21.0	21.0				90.0		58.0	58.0			
Effective Green, g (s)	23.0	23.0				90.0		60.0	60.0			
Actuated g/C Ratio	0.26	0.26				1.00		0.67	0.67			
Clearance Time (s)								7.0	7.0			
Vehicle Extension (s)								2.0	2.0			
Lane Grp Cap (vph)	430	434				1611		2359	1055			
v/s Ratio Prot	c0.10	0.10						c0.54				
v/s Ratio Perm						0.14		0.04				
v/c Ratio	0.39	0.38				0.14		0.80	0.06			
Uniform Delay, d1	27.7	27.7				0.0		10.8	5.2			
Progression Factor	0.02	0.02				1.00		0.51	0.45			
Incremental Delay, d2	0.5	0.5				0.2		2.4	0.1			
Delay (s)	1.1	1.0				0.2		7.9	2.4			
Level of Service	A	A				A		A	A			
Approach Delay (s)		1.0			0.2			7.7			0.0	
Approach LOS		A			A			A			A	

Intersection Summary

HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 102: Hilltop Needmore Rd & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	370	35	0	0	0	275	0	2300	74	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				2.0		5.0	5.0			
Lane Util. Factor	0.91	0.91				1.00		0.91	1.00			
Frt	1.00	1.00				0.86		1.00	0.85			
Flt Protected	0.95	0.96				1.00		1.00	1.00			
Satd. Flow (prot)	3221	1635				1611		5085	1583			
Flt Permitted	0.95	0.96				1.00		1.00	1.00			
Satd. Flow (perm)	3221	1635				1611		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	411	39	0	0	0	306	0	2556	82	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	300	150	0	0	0	306	0	2556	82	0	0	0
Turn Type	Split					Free		Perm				
Protected Phases	7 8	7 8						2				
Permitted Phases						Free			2			
Actuated Green, G (s)	16.0	16.0				60.0		33.0	33.0			
Effective Green, g (s)	18.0	18.0				60.0		35.0	35.0			
Actuated g/C Ratio	0.30	0.30				1.00		0.58	0.58			
Clearance Time (s)								7.0	7.0			
Vehicle Extension (s)								2.0	2.0			
Lane Grp Cap (vph)	966	491				1611		2966	923			
v/s Ratio Prot	c0.09	0.09						c0.50				
v/s Ratio Perm						0.19			0.05			
v/c Ratio	0.31	0.31				0.19		0.86	0.09			
Uniform Delay, d1	16.2	16.2				0.0		10.5	5.5			
Progression Factor	0.01	0.03				1.00		0.40	0.24			
Incremental Delay, d2	0.1	0.3				0.3		3.0	0.2			
Delay (s)	0.4	0.7				0.3		7.1	1.5			
Level of Service	A	A				A		A	A			
Approach Delay (s)		0.5			0.3			6.9			0.0	
Approach LOS		A			A			A			A	

Intersection Summary

HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 102: Hilltop Needmore Rd & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	299	64	0	0	0	180	0	855	72	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				2.0		5.0	5.0			
Lane Util. Factor	0.95	0.95				1.00		0.95	1.00			
Frt	1.00	1.00				0.86		1.00	0.85			
Flt Protected	0.95	0.97				1.00		1.00	1.00			
Satd. Flow (prot)	1681	1714				1611		3539	1583			
Flt Permitted	0.95	0.97				1.00		1.00	1.00			
Satd. Flow (perm)	1681	1714				1611		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	332	71	0	0	0	200	0	950	80	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	199	204	0	0	0	200	0	950	80	0	0	0
Turn Type	Split					Free		Perm				
Protected Phases	7 8	7 8						2				
Permitted Phases						Free			2			
Actuated Green, G (s)	19.0	19.0				60.0		30.0	30.0			
Effective Green, g (s)	21.0	21.0				60.0		32.0	32.0			
Actuated g/C Ratio	0.35	0.35				1.00		0.53	0.53			
Clearance Time (s)								7.0	7.0			
Vehicle Extension (s)								2.0	2.0			
Lane Grp Cap (vph)	588	600				1611		1887	844			
v/s Ratio Prot	0.12	c0.12						c0.27				
v/s Ratio Perm						0.12			0.05			
v/c Ratio	0.34	0.34				0.12		0.50	0.09			
Uniform Delay, d1	14.4	14.4				0.0		8.9	6.9			
Progression Factor	0.03	0.03				1.00		0.38	0.29			
Incremental Delay, d2	0.3	0.3				0.2		0.9	0.2			
Delay (s)	0.7	0.7				0.2		4.3	2.2			
Level of Service	A	A				A		A	A			
Approach Delay (s)		0.7			0.2			4.1			0.0	
Approach LOS		A			A			A			A	

Intersection Summary

HCM Average Control Delay	2.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



HCM Signalized Intersection Capacity Analysis  
 102: Hilltop Needmore Rd & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↖				↗		↑↑↑	↗			
Volume (vph)	403	86	0	0	0	244	0	1153	98	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0				2.0		5.0	5.0			
Lane Util. Factor	0.91	0.91				1.00		0.91	1.00			
Frt	1.00	1.00				0.86		1.00	0.85			
Flt Protected	0.95	0.98				1.00		1.00	1.00			
Satd. Flow (prot)	3221	1655				1611		5085	1583			
Flt Permitted	0.95	0.98				1.00		1.00	1.00			
Satd. Flow (perm)	3221	1655				1611		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	448	96	0	0	0	271	0	1281	109	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	358	186	0	0	0	271	0	1281	109	0	0	0
Turn Type	Split					Free		Perm				
Protected Phases	7 8	7 8						2				
Permitted Phases						Free		2				
Actuated Green, G (s)	18.0	18.0				60.0		31.0	31.0			
Effective Green, g (s)	20.0	20.0				60.0		33.0	33.0			
Actuated g/C Ratio	0.33	0.33				1.00		0.55	0.55			
Clearance Time (s)								7.0	7.0			
Vehicle Extension (s)								2.0	2.0			
Lane Grp Cap (vph)	1074	552				1611		2797	871			
v/s Ratio Prot	0.11	c0.11						c0.25				
v/s Ratio Perm						0.17		0.07				
v/c Ratio	0.33	0.34				0.17		0.46	0.13			
Uniform Delay, d1	15.0	15.0				0.0		8.1	6.5			
Progression Factor	0.02	0.03				1.00		0.39	0.34			
Incremental Delay, d2	0.2	0.3				0.2		0.5	0.3			
Delay (s)	0.4	0.8				0.2		3.7	2.5			
Level of Service	A	A				A		A	A			
Approach Delay (s)		0.5			0.2			3.6			0.0	
Approach LOS		A			A			A			A	

Intersection Summary

HCM Average Control Delay	2.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 201: North U-turn Median & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶↶					↷↷
Volume (vph)	149	0	0	0	0	897
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	166	0	0	0	0	997
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	166	0	0	0	0	997
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	9.7					66.3
Effective Green, g (s)	11.7					68.3
Actuated g/C Ratio	0.13					0.76
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	446					2686
v/s Ratio Prot	c0.05					c0.28
v/s Ratio Perm						
v/c Ratio	0.37					0.37
Uniform Delay, d1	35.8					3.6
Progression Factor	0.99					1.00
Incremental Delay, d2	0.4					0.4
Delay (s)	35.9					4.0
Level of Service	D					A
Approach Delay (s)	35.9		0.0			4.0
Approach LOS	D		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			8.6		HCM Level of Service	A
HCM Volume to Capacity ratio			0.37			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			88.6%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 201: North U-turn Median & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	←←					→→→
Volume (vph)	199	0	0	0	0	1207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	221	0	0	0	0	1341
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	221	0	0	0	0	1341
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	9.2					36.8
Effective Green, g (s)	11.2					38.8
Actuated g/C Ratio	0.19					0.65
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	641					3288
v/s Ratio Prot	c0.06					c0.26
v/s Ratio Perm						
v/c Ratio	0.34					0.41
Uniform Delay, d1	21.2					5.1
Progression Factor	0.69					1.00
Incremental Delay, d2	0.2					0.4
Delay (s)	14.8					5.5
Level of Service	B					A
Approach Delay (s)	14.8		0.0			5.5
Approach LOS	B		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			6.8		HCM Level of Service	A
HCM Volume to Capacity ratio			0.39			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			83.9%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 201: North U-turn Median & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↕↕
Volume (vph)	191	0	0	0	0	1688
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	212	0	0	0	0	1876
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	212	0	0	0	0	1876
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	9.1					36.9
Effective Green, g (s)	11.1					38.9
Actuated g/C Ratio	0.18					0.65
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	635					2294
v/s Ratio Prot	c0.06					c0.53
v/s Ratio Perm						
v/c Ratio	0.33					0.82
Uniform Delay, d1	21.2					7.9
Progression Factor	0.76					1.00
Incremental Delay, d2	0.3					3.4
Delay (s)	16.5					11.3
Level of Service	B					B
Approach Delay (s)	16.5		0.0			11.3
Approach LOS	B		A			B
<b>Intersection Summary</b>						
HCM Average Control Delay			11.8		HCM Level of Service	B
HCM Volume to Capacity ratio			0.71			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			85.8%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 201: North U-turn Median & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙↘					↑↑↑
Volume (vph)	259	0	0	0	0	2273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	288	0	0	0	0	2526
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	288	0	0	0	0	2526
Turn Type						
Protected Phases	8			6		
Permitted Phases						
Actuated Green, G (s)	10.2			35.8		
Effective Green, g (s)	12.2			37.8		
Actuated g/C Ratio	0.20			0.63		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	698			3204		
v/s Ratio Prot	c0.08			c0.50		
v/s Ratio Perm						
v/c Ratio	0.41			0.79		
Uniform Delay, d1	20.8			8.2		
Progression Factor	0.80			1.00		
Incremental Delay, d2	0.4			2.0		
Delay (s)	16.9			10.2		
Level of Service	B			B		
Approach Delay (s)	16.9		0.0			10.2
Approach LOS	B		A			B
<b>Intersection Summary</b>						
HCM Average Control Delay			10.9	HCM Level of Service		B
HCM Volume to Capacity ratio			0.70			
Actuated Cycle Length (s)			60.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization			81.2%	ICU Level of Service		D
Analysis Period (min)			15			
c Critical Lane Group						

# **Reverse Superstreet and Relocated Hilltop Road with Direct Main Street Lefts**

# HCM Signalized Intersection Capacity Analysis

## 22: U-turn S of LW & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶			↷		
Volume (vph)	33	0	0	1725	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	37	0	0	1917	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	37	0	0	1917	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	5.1			70.9		
Effective Green, g (s)	7.1			72.9		
Actuated g/C Ratio	0.08			0.81		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	140			2867		
v/s Ratio Prot	c0.02			c0.54		
v/s Ratio Perm						
v/c Ratio	0.26			0.67		
Uniform Delay, d1	39.0			3.5		
Progression Factor	0.73			1.00		
Incremental Delay, d2	1.0			1.3		
Delay (s)	29.4			4.8		
Level of Service	C			A		
Approach Delay (s)	29.4			4.8	0.0	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	5.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 22: U-turn S of LW & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	44	0	0	2322	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	49	0	0	2580	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	49	0	0	2580	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	4.8			41.2		
Effective Green, g (s)	6.8			43.2		
Actuated g/C Ratio	0.11			0.72		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	201			3661		
v/s Ratio Prot	c0.03			c0.51		
v/s Ratio Perm						
v/c Ratio	0.24			0.70		
Uniform Delay, d1	24.3			4.8		
Progression Factor	0.94			1.00		
Incremental Delay, d2	0.6			1.2		
Delay (s)	23.3			5.9		
Level of Service	C			A		
Approach Delay (s)	23.3			5.9	0.0	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



# HCM Signalized Intersection Capacity Analysis

## 22: U-turn S of LW & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶			↷		
Volume (vph)	77	0	0	1040	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	86	0	0	1156	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	86	0	0	1156	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	7.2			38.8		
Effective Green, g (s)	9.2			40.8		
Actuated g/C Ratio	0.15			0.68		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	271			2407		
v/s Ratio Prot	c0.05			c0.33		
v/s Ratio Perm						
v/c Ratio	0.32			0.48		
Uniform Delay, d1	22.6			4.6		
Progression Factor	1.00			1.00		
Incremental Delay, d2	0.5			0.7		
Delay (s)	23.2			5.3		
Level of Service	C			A		
Approach Delay (s)	23.2			5.3	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	6.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 22: U-turn S of LW & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶			↷↷↷		
Volume (vph)	104	0	0	1402	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	116	0	0	1558	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	116	0	0	1558	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	8.1			37.9		
Effective Green, g (s)	10.1			39.9		
Actuated g/C Ratio	0.17			0.66		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	298			3382		
v/s Ratio Prot	c0.07			c0.31		
v/s Ratio Perm						
v/c Ratio	0.39			0.46		
Uniform Delay, d1	22.2			4.9		
Progression Factor	0.91			1.00		
Incremental Delay, d2	0.6			0.5		
Delay (s)	20.8			5.3		
Level of Service	C			A		
Approach Delay (s)	20.8			5.3	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 31: Lake Wheeler Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↑↑		↑						↑↑	↑
Volume (vph)	0	0	308	0	163	0	0	0	0	0	662	232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0		5.0						5.0	5.0
Lane Util. Factor			0.88		1.00						0.95	1.00
Frt			0.85		1.00						1.00	0.85
Flt Protected			1.00		1.00						1.00	1.00
Satd. Flow (prot)			2787		1863						3539	1583
Flt Permitted			1.00		1.00						1.00	1.00
Satd. Flow (perm)			2787		1863						3539	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	0	342	0	181	0	0	0	0	0	736	258
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	342	0	181	0	0	0	0	0	736	258
Turn Type			custom									Perm
Protected Phases			4		8						6	
Permitted Phases												6
Actuated Green, G (s)			16.4		16.4						59.6	59.6
Effective Green, g (s)			18.4		18.4						61.6	61.6
Actuated g/C Ratio			0.20		0.20						0.68	0.68
Clearance Time (s)			7.0		7.0						7.0	7.0
Vehicle Extension (s)			3.0		3.0						3.0	3.0
Lane Grp Cap (vph)			570		381						2422	1083
v/s Ratio Prot			c0.12		0.10						c0.21	
v/s Ratio Perm												0.16
v/c Ratio			0.60		0.48						0.30	0.24
Uniform Delay, d1			32.5		31.5						5.7	5.4
Progression Factor			1.00		0.86						0.65	0.63
Incremental Delay, d2			1.7		0.7						0.3	0.5
Delay (s)			34.2		27.9						4.0	3.9
Level of Service			C		C						A	A
Approach Delay (s)		34.2			27.9		0.0				3.9	
Approach LOS		C			C		A				A	

### Intersection Summary

HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 31: Lake Wheeler Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↑↑		↑						↑↑↑	↑
Volume (vph)	0	0	415	0	219	0	0	0	0	0	892	312
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0		5.0						5.0	5.0
Lane Util. Factor			0.88		1.00						0.91	1.00
Frt			0.85		1.00						1.00	0.85
Flt Protected			1.00		1.00						1.00	1.00
Satd. Flow (prot)			2787		1863						5085	1583
Flt Permitted			1.00		1.00						1.00	1.00
Satd. Flow (perm)			2787		1863						5085	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	0	461	0	243	0	0	0	0	0	991	347
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	461	0	243	0	0	0	0	0	991	347
Turn Type			custom									Perm
Protected Phases			4		8						6	
Permitted Phases												6
Actuated Green, G (s)			14.7		14.7						31.3	31.3
Effective Green, g (s)			16.7		16.7						33.3	33.3
Actuated g/C Ratio			0.28		0.28						0.55	0.55
Clearance Time (s)			7.0		7.0						7.0	7.0
Vehicle Extension (s)			3.0		3.0						3.0	3.0
Lane Grp Cap (vph)			776		519						2822	879
v/s Ratio Prot			c0.17		0.13						0.19	
v/s Ratio Perm												c0.22
v/c Ratio			0.59		0.47						0.35	0.39
Uniform Delay, d1			18.7		18.0						7.4	7.6
Progression Factor			1.00		0.69						0.54	0.51
Incremental Delay, d2			1.2		0.5						0.3	1.2
Delay (s)			19.9		12.8						4.3	5.1
Level of Service			B		B						A	A
Approach Delay (s)		19.9			12.8			0.0			4.5	
Approach LOS		B			B			A			A	

### Intersection Summary

HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 31: Lake Wheeler Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↑↑		↑						↑↑	↑
Volume (vph)	0	0	260	0	244	0	0	0	0	0	1296	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0		5.0						5.0	5.0
Lane Util. Factor			0.88		1.00						0.95	1.00
Frt			0.85		1.00						1.00	0.85
Flt Protected			1.00		1.00						1.00	1.00
Satd. Flow (prot)			2787		1863						3539	1583
Flt Permitted			1.00		1.00						1.00	1.00
Satd. Flow (perm)			2787		1863						3539	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	0	289	0	271	0	0	0	0	0	1440	183
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	289	0	271	0	0	0	0	0	1440	183
Turn Type			custom									Perm
Protected Phases			4		8						6	
Permitted Phases												6
Actuated Green, G (s)			12.5		12.5						33.5	33.5
Effective Green, g (s)			14.5		14.5						35.5	35.5
Actuated g/C Ratio			0.24		0.24						0.59	0.59
Clearance Time (s)			7.0		7.0						7.0	7.0
Vehicle Extension (s)			3.0		3.0						3.0	3.0
Lane Grp Cap (vph)			674		450						2094	937
v/s Ratio Prot			0.10		c0.15						c0.41	
v/s Ratio Perm												0.12
v/c Ratio			0.43		0.60						0.69	0.20
Uniform Delay, d1			19.2		20.2						8.4	5.7
Progression Factor			1.00		0.87						0.29	0.23
Incremental Delay, d2			0.4		2.1						1.4	0.3
Delay (s)			19.7		19.6						3.8	1.7
Level of Service			B		B						A	A
Approach Delay (s)		19.7			19.6			0.0			3.5	
Approach LOS		B			B			A			A	

Intersection Summary		
HCM Average Control Delay	7.7	HCM Level of Service A
HCM Volume to Capacity ratio	0.66	
Actuated Cycle Length (s)	60.0	Sum of lost time (s) 10.0
Intersection Capacity Utilization	78.0%	ICU Level of Service D
Analysis Period (min)	15	
c Critical Lane Group		

# HCM Signalized Intersection Capacity Analysis

## 31: Lake Wheeler Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↑↑		↑						↑↑↑	↑
Volume (vph)	0	0	350	0	329	0	0	0	0	0	1747	222
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			5.0		5.0						5.0	5.0
Lane Util. Factor			0.88		1.00						0.91	1.00
Frt			0.85		1.00						1.00	0.85
Flt Protected			1.00		1.00						1.00	1.00
Satd. Flow (prot)			2787		1863						5085	1583
Flt Permitted			1.00		1.00						1.00	1.00
Satd. Flow (perm)			2787		1863						5085	1583
Peak-hour factor, 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
Adj. Flow (vph)	0	0	389	0	366	0	0	0	0	0	1941	247
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	389	0	366	0	0	0	0	0	1941	247
Turn Type			custom									Perm
Protected Phases			4		8						6	
Permitted Phases												6
Actuated Green, G (s)			15.6		15.6						30.4	30.4
Effective Green, g (s)			17.6		17.6						32.4	32.4
Actuated g/C Ratio			0.29		0.29						0.54	0.54
Clearance Time (s)			7.0		7.0						7.0	7.0
Vehicle Extension (s)			3.0		3.0						3.0	3.0
Lane Grp Cap (vph)			818		546						2746	855
v/s Ratio Prot			0.14		c0.20						c0.38	
v/s Ratio Perm												0.16
v/c Ratio			0.48		0.67						0.71	0.29
Uniform Delay, d1			17.4		18.6						10.3	7.5
Progression Factor			1.00		1.06						0.34	0.26
Incremental Delay, d2			0.4		3.0						1.2	0.6
Delay (s)			17.8		22.8						4.7	2.6
Level of Service			B		C						A	A
Approach Delay (s)		17.8			22.8		0.0				4.4	
Approach LOS		B			C		A				A	

### Intersection Summary

HCM Average Control Delay	8.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	77.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 34: Relocated Hilltop Rd & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑				↗↘		↑↑	↗			
Volume (vph)	0	51	0	0	0	351	0	1588	7	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		1.00				0.88		0.95	1.00			
Frt		1.00				0.85		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		1863				2787		3539	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		1863				2787		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	57	0	0	0	390	0	1764	8	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	57	0	0	0	390	0	1764	8	0	0	0
Turn Type						custom			Perm			
Protected Phases		4				8		2				
Permitted Phases									2			
Actuated Green, G (s)		16.4				16.4		59.6	59.6			
Effective Green, g (s)		18.4				18.4		61.6	61.6			
Actuated g/C Ratio		0.20				0.20		0.68	0.68			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		381				570		2422	1083			
v/s Ratio Prot		0.03				c0.14		c0.50				
v/s Ratio Perm									0.01			
v/c Ratio		0.15				0.68		0.73	0.01			
Uniform Delay, d1		29.4				33.1		8.9	4.5			
Progression Factor		0.84				1.00		0.64	0.75			
Incremental Delay, d2		0.2				3.4		1.5	0.0			
Delay (s)		24.8				36.5		7.3	3.4			
Level of Service		C				D		A	A			
Approach Delay (s)		24.8			36.5			7.2			0.0	
Approach LOS		C			D			A			A	

### Intersection Summary

HCM Average Control Delay	12.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 34: Relocated Hilltop Rd & US 401 NB Lanes

7/5/2013















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑				↗↘		↑↑↑	↗			
Volume (vph)	0	68	0	0	0	474	0	2139	9	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		1.00				0.88		0.91	1.00			
Frt		1.00				0.85		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		1863				2787		5085	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		1863				2787		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	76	0	0	0	527	0	2377	10	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	76	0	0	0	527	0	2377	10	0	0	0
Turn Type						custom			Perm			
Protected Phases		4				8		2				
Permitted Phases									2			
Actuated Green, G (s)		13.5				13.5		32.5	32.5			
Effective Green, g (s)		15.5				15.5		34.5	34.5			
Actuated g/C Ratio		0.26				0.26		0.58	0.58			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		481				720		2924	910			
v/s Ratio Prot		0.04				c0.19		c0.47				
v/s Ratio Perm									0.01			
v/c Ratio		0.16				0.73		0.81	0.01			
Uniform Delay, d1		17.2				20.3		10.2	5.5			
Progression Factor		1.50				1.00		0.56	0.43			
Incremental Delay, d2		0.1				3.9		2.0	0.0			
Delay (s)		26.0				24.2		7.7	2.4			
Level of Service		C				C		A	A			
Approach Delay (s)		26.0			24.2			7.7			0.0	
Approach LOS		C			C			A			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			11.0			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			60.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			90.5%			ICU Level of Service			E			
Analysis Period (min)			15									
c	Critical Lane Group											



HCM Signalized Intersection Capacity Analysis  
 34: Relocated Hilltop Rd & US 401 NB Lanes

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑				↑↑		↑↑	↑			
Volume (vph)	0	205	0	0	0	188	0	799	74	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		1.00				0.88		0.95	1.00			
Frt		1.00				0.85		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		1863				2787		3539	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		1863				2787		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	228	0	0	0	209	0	888	82	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	228	0	0	0	209	0	888	82	0	0	0
Turn Type						custom						Perm
Protected Phases		4				8		2				
Permitted Phases									2			
Actuated Green, G (s)		12.5				12.5		33.5	33.5			
Effective Green, g (s)		14.5				14.5		35.5	35.5			
Actuated g/C Ratio		0.24				0.24		0.59	0.59			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		450				674		2094	937			
v/s Ratio Prot		c0.12				0.07		c0.25				
v/s Ratio Perm									0.05			
v/c Ratio		0.51				0.31		0.42	0.09			
Uniform Delay, d1		19.7				18.6		6.7	5.3			
Progression Factor		1.10				1.00		0.47	0.45			
Incremental Delay, d2		0.7				0.3		0.6	0.2			
Delay (s)		22.3				18.9		3.7	2.5			
Level of Service		C				B		A	A			
Approach Delay (s)		22.3			18.9			3.6			0.0	
Approach LOS		C			B			A			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			8.9				HCM Level of Service		A			
HCM Volume to Capacity ratio			0.45									
Actuated Cycle Length (s)			60.0				Sum of lost time (s)		10.0			
Intersection Capacity Utilization			78.4%				ICU Level of Service		D			
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis  
 34: Relocated Hilltop Rd & US 401 NB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑				↗↘		↑↑↑	↗			
Volume (vph)	0	277	0	0	0	255	0	1077	99	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0				5.0		5.0	5.0			
Lane Util. Factor		1.00				0.88		0.91	1.00			
Frt		1.00				0.85		1.00	0.85			
Flt Protected		1.00				1.00		1.00	1.00			
Satd. Flow (prot)		1863				2787		5085	1583			
Flt Permitted		1.00				1.00		1.00	1.00			
Satd. Flow (perm)		1863				2787		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	0	308	0	0	0	283	0	1197	110	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	308	0	0	0	283	0	1197	110	0	0	0
Turn Type						custom			Perm			
Protected Phases		4						2				
Permitted Phases						8			2			
Actuated Green, G (s)		15.0				15.0		31.0	31.0			
Effective Green, g (s)		17.0				17.0		33.0	33.0			
Actuated g/C Ratio		0.28				0.28		0.55	0.55			
Clearance Time (s)		7.0				7.0		7.0	7.0			
Vehicle Extension (s)		3.0				3.0		3.0	3.0			
Lane Grp Cap (vph)		528				790		2797	871			
v/s Ratio Prot		c0.17						c0.24				
v/s Ratio Perm						0.10			0.07			
v/c Ratio		0.58				0.36		0.43	0.13			
Uniform Delay, d1		18.5				17.1		7.9	6.5			
Progression Factor		1.24				1.00		0.52	0.46			
Incremental Delay, d2		1.3				0.3		0.4	0.3			
Delay (s)		24.1				17.4		4.6	3.3			
Level of Service		C				B		A	A			
Approach Delay (s)		24.1			17.4			4.5			0.0	
Approach LOS		C			B			A			A	

Intersection Summary		
HCM Average Control Delay	9.6	HCM Level of Service
HCM Volume to Capacity ratio	0.48	A
Actuated Cycle Length (s)	60.0	Sum of lost time (s)
Intersection Capacity Utilization	77.1%	10.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		D

# HCM Signalized Intersection Capacity Analysis

## 41: U-turn N of LW & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	207	0	0	0	0	738
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1770					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1770					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	230	0	0	0	0	820
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	230	0	0	0	0	820
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	17.1					58.9
Effective Green, g (s)	19.1					60.9
Actuated g/C Ratio	0.21					0.68
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	376					2395
v/s Ratio Prot	c0.13					c0.23
v/s Ratio Perm						
v/c Ratio	0.61					0.34
Uniform Delay, d1	32.1					6.1
Progression Factor	0.82					0.61
Incremental Delay, d2	2.0					0.4
Delay (s)	28.3					4.1
Level of Service	C					A
Approach Delay (s)	28.3		0.0			4.1
Approach LOS	C		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			9.4		HCM Level of Service	A
HCM Volume to Capacity ratio			0.41			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			75.8%		ICU Level of Service	D
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM Signalized Intersection Capacity Analysis

## 41: U-turn N of LW & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶					↷↷↷
Volume (vph)	279	0	0	0	0	993
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1770					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1770					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	310	0	0	0	0	1103
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	310	0	0	0	0	1103
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	15.6					30.4
Effective Green, g (s)	17.6					32.4
Actuated g/C Ratio	0.29					0.54
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	519					2746
v/s Ratio Prot	c0.18					c0.22
v/s Ratio Perm						
v/c Ratio	0.60					0.40
Uniform Delay, d1	18.2					8.1
Progression Factor	0.64					0.53
Incremental Delay, d2	1.1					0.4
Delay (s)	12.7					4.7
Level of Service	B					A
Approach Delay (s)	12.7		0.0			4.7
Approach LOS	B		A			A

### Intersection Summary

HCM Average Control Delay	6.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 41: U-turn N of LW & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖					↗↗
Volume (vph)	111	0	0	0	0	1555
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1770					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1770					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	123	0	0	0	0	1728
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	123	0	0	0	0	1728
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	8.3					37.7
Effective Green, g (s)	10.3					39.7
Actuated g/C Ratio	0.17					0.66
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	304					2342
v/s Ratio Prot	c0.07					c0.49
v/s Ratio Perm						
v/c Ratio	0.40					0.74
Uniform Delay, d1	22.1					6.7
Progression Factor	0.70					0.35
Incremental Delay, d2	0.8					1.4
Delay (s)	16.2					3.8
Level of Service	B					A
Approach Delay (s)	16.2		0.0			3.8
Approach LOS	B		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			4.6		HCM Level of Service	A
HCM Volume to Capacity ratio			0.67			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			74.7%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 41: U-turn N of LW & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	150	0	0	0	0	2096
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1770					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1770					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	167	0	0	0	0	2329
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	167	0	0	0	0	2329

Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	9.1					36.9
Effective Green, g (s)	11.1					38.9
Actuated g/C Ratio	0.18					0.65
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	327					3297
v/s Ratio Prot	c0.09					c0.46
v/s Ratio Perm						
v/c Ratio	0.51					0.71
Uniform Delay, d1	22.0					6.8
Progression Factor	0.66					0.18
Incremental Delay, d2	1.3					0.8
Delay (s)	15.7					2.1
Level of Service	B					A
Approach Delay (s)	15.7		0.0			2.1
Approach LOS	B		A			A

Intersection Summary						
HCM Average Control Delay			3.0		HCM Level of Service	A
HCM Volume to Capacity ratio			0.66			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			70.9%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶			↷↷		
Volume (vph)	57	0	0	1733	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.95		
Fr <sub>t</sub>	1.00			1.00		
Fl <sub>t</sub> Protected	0.95			1.00		
Satd. Flow (prot)	1770			3539		
Fl <sub>t</sub> Permitted	0.95			1.00		
Satd. Flow (perm)	1770			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	63	0	0	1926	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	63	0	0	1926	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	7.5			68.5		
Effective Green, g (s)	9.5			70.5		
Actuated g/C Ratio	0.11			0.78		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	187			2772		
v/s Ratio Prot	c0.04			c0.54		
v/s Ratio Perm						
v/c Ratio	0.34			0.69		
Uniform Delay, d <sub>1</sub>	37.3			4.6		
Progression Factor	0.81			0.47		
Incremental Delay, d <sub>2</sub>	1.0			1.0		
Delay (s)	31.4			3.2		
Level of Service	C			A		
Approach Delay (s)	31.4			3.2	0.0	
Approach LOS	C			A	A	

### Intersection Summary

HCM Average Control Delay	4.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↑↑↑		
Volume (vph)	75	0	0	2334	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	83	0	0	2593	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	83	0	0	2593	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	5.7			40.3		
Effective Green, g (s)	7.7			42.3		
Actuated g/C Ratio	0.13			0.70		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	227			3585		
v/s Ratio Prot	c0.05			c0.51		
v/s Ratio Perm						
v/c Ratio	0.37			0.72		
Uniform Delay, d1	23.9			5.3		
Progression Factor	0.83			0.36		
Incremental Delay, d2	1.0			0.8		
Delay (s)	20.8			2.7		
Level of Service	C			A		
Approach Delay (s)	20.8			2.7	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	3.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↵			↑↑		
Volume (vph)	116	0	0	876	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			3539		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	129	0	0	973	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	129	0	0	973	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	8.4			37.6		
Effective Green, g (s)	10.4			39.6		
Actuated g/C Ratio	0.17			0.66		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	307			2336		
v/s Ratio Prot	c0.07			c0.27		
v/s Ratio Perm						
v/c Ratio	0.42			0.42		
Uniform Delay, d1	22.1			4.8		
Progression Factor	0.73			0.62		
Incremental Delay, d2	0.6			0.5		
Delay (s)	16.8			3.5		
Level of Service	B			A		
Approach Delay (s)	16.8			3.5	0.0	
Approach LOS	B			A	A	

### Intersection Summary

HCM Average Control Delay	5.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 52: South Median Break & US 401 NB Lanes

7/5/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↖			↑↑↑		
Volume (vph)	155	0	0	1183	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0		
Lane Util. Factor	1.00			0.91		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	1770			5085		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	1770			5085		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	172	0	0	1314	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	172	0	0	1314	0	0
Turn Type						
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	9.7			36.3		
Effective Green, g (s)	11.7			38.3		
Actuated g/C Ratio	0.19			0.64		
Clearance Time (s)	7.0			7.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	345			3246		
v/s Ratio Prot	c0.10			c0.26		
v/s Ratio Perm						
v/c Ratio	0.50			0.40		
Uniform Delay, d1	21.5			5.3		
Progression Factor	0.67			0.58		
Incremental Delay, d2	0.7			0.4		
Delay (s)	15.1			3.4		
Level of Service	B			A		
Approach Delay (s)	15.1			3.4	0.0	
Approach LOS	B			A	A	

### Intersection Summary

HCM Average Control Delay	4.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗								↑↑	↗↘
Volume (vph)	0	275	32	0	0	0	0	0	0	0	763	283
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0								5.0	5.0
Lane Util. Factor		0.95	1.00								0.95	0.88
Frt		1.00	0.85								1.00	0.85
Flt Protected		1.00	1.00								1.00	1.00
Satd. Flow (prot)		3539	1583								3539	2787
Flt Permitted		1.00	1.00								1.00	1.00
Satd. Flow (perm)		3539	1583								3539	2787
Peak-hour factor, 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
Adj. Flow (vph)	0	306	36	0	0	0	0	0	0	0	848	314
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	306	36	0	0	0	0	0	0	0	848	314
Turn Type			Perm									custom
Protected Phases		7									6 8	7
Permitted Phases			7									6 8
Actuated Green, G (s)		10.7	10.7								68.3	79.0
Effective Green, g (s)		12.7	12.7								70.3	83.0
Actuated g/C Ratio		0.14	0.14								0.78	0.92
Clearance Time (s)		7.0	7.0									7.0
Vehicle Extension (s)		3.0	3.0									3.0
Lane Grp Cap (vph)		499	223								2764	2725
v/s Ratio Prot		c0.09									c0.24	0.02
v/s Ratio Perm			0.02									0.10
v/c Ratio		0.61	0.16								0.31	0.12
Uniform Delay, d1		36.3	34.0								2.8	0.3
Progression Factor		1.00	1.00								0.82	1.00
Incremental Delay, d2		2.2	0.3								0.1	0.0
Delay (s)		38.6	34.3								2.4	0.3
Level of Service		D	C								A	A
Approach Delay (s)		38.1			0.0			0.0			1.8	
Approach LOS		D			A			A			A	

### Intersection Summary

HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑								↑↑↑	↑↑
Volume (vph)	0	370	42	0	0	0	0	0	0	0	1026	380
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0								5.0	5.0
Lane Util. Factor		0.91	1.00								0.91	0.88
Frt		1.00	0.85								1.00	0.85
Flt Protected		1.00	1.00								1.00	1.00
Satd. Flow (prot)		5085	1583								5085	2787
Flt Permitted		1.00	1.00								1.00	1.00
Satd. Flow (perm)		5085	1583								5085	2787
Peak-hour factor, 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
Adj. Flow (vph)	0	411	47	0	0	0	0	0	0	0	1140	422
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	411	47	0	0	0	0	0	0	0	1140	422
Turn Type			Perm									custom
Protected Phases		7									6 8	7
Permitted Phases			7									6 8
Actuated Green, G (s)		7.0	7.0								39.0	46.0
Effective Green, g (s)		9.0	9.0								39.0	48.0
Actuated g/C Ratio		0.15	0.15								0.65	0.80
Clearance Time (s)		7.0	7.0									7.0
Vehicle Extension (s)		3.0	3.0									3.0
Lane Grp Cap (vph)		763	237								3305	2694
v/s Ratio Prot		c0.08									c0.22	0.02
v/s Ratio Perm			0.03									0.13
v/c Ratio		0.54	0.20								0.34	0.16
Uniform Delay, d1		23.6	22.3								4.7	1.4
Progression Factor		1.00	1.00								0.47	1.00
Incremental Delay, d2		0.7	0.4								0.1	0.0
Delay (s)		24.3	22.8								2.3	1.4
Level of Service		C	C								A	A
Approach Delay (s)		24.2			0.0			0.0			2.0	
Approach LOS		C			A			A			A	

### Intersection Summary

HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗								↑↑	↗↘
Volume (vph)	0	299	150	0	0	0	0	0	0	0	1521	358
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0								5.0	5.0
Lane Util. Factor		0.95	1.00								0.95	0.88
Frt		1.00	0.85								1.00	0.85
Flt Protected		1.00	1.00								1.00	1.00
Satd. Flow (prot)		3539	1583								3539	2787
Flt Permitted		1.00	1.00								1.00	1.00
Satd. Flow (perm)		3539	1583								3539	2787
Peak-hour factor, 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
Adj. Flow (vph)	0	332	167	0	0	0	0	0	0	0	1690	398
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	332	167	0	0	0	0	0	0	0	1690	398
Turn Type			Perm									custom
Protected Phases		7									6 8	7
Permitted Phases			7									6 8
Actuated Green, G (s)		9.6	9.6								36.4	46.0
Effective Green, g (s)		11.6	11.6								36.4	48.0
Actuated g/C Ratio		0.19	0.19								0.61	0.80
Clearance Time (s)		7.0	7.0									7.0
Vehicle Extension (s)		3.0	3.0									3.0
Lane Grp Cap (vph)		684	306								2147	2694
v/s Ratio Prot		0.09									c0.48	0.03
v/s Ratio Perm			c0.11									0.11
v/c Ratio		0.49	0.55								0.79	0.15
Uniform Delay, d1		21.5	21.8								8.9	1.4
Progression Factor		1.00	1.00								0.34	1.00
Incremental Delay, d2		0.5	2.0								1.3	0.0
Delay (s)		22.1	23.8								4.3	1.4
Level of Service		C	C								A	A
Approach Delay (s)		22.7			0.0			0.0			3.7	
Approach LOS		C			A			A			A	

### Intersection Summary

HCM Average Control Delay	7.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 101: Hilltop Needmore Rd & US 401 SB Lanes

7/5/2013





















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations		↑↑↑	↑								↑↑↑	↑↑		
Volume (vph)	0	403	201	0	0	0	0	0	0	0	2050	482		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)		5.0	5.0								5.0	5.0		
Lane Util. Factor		0.91	1.00								0.91	0.88		
Frt		1.00	0.85								1.00	0.85		
Flt Protected		1.00	1.00								1.00	1.00		
Satd. Flow (prot)		5085	1583								5085	2787		
Flt Permitted		1.00	1.00								1.00	1.00		
Satd. Flow (perm)		5085	1583								5085	2787		
Peak-hour factor, 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		
Adj. Flow (vph)	0	448	223	0	0	0	0	0	0	0	2278	536		
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0		
Lane Group Flow (vph)	0	448	223	0	0	0	0	0	0	0	2278	536		
Turn Type			Perm									custom		
Protected Phases		7									6 8	7		
Permitted Phases			7									6 8		
Actuated Green, G (s)		13.2	13.2								32.8	46.0		
Effective Green, g (s)		15.2	15.2								32.8	48.0		
Actuated g/C Ratio		0.25	0.25								0.55	0.80		
Clearance Time (s)		7.0	7.0									7.0		
Vehicle Extension (s)		3.0	3.0									3.0		
Lane Grp Cap (vph)		1288	401								2780	2694		
v/s Ratio Prot		0.09									c0.45	0.05		
v/s Ratio Perm			c0.14									0.14		
v/c Ratio		0.35	0.56								0.82	0.20		
Uniform Delay, d1		18.3	19.5								11.2	1.4		
Progression Factor		1.00	1.00								0.44	1.00		
Incremental Delay, d2		0.2	1.7								1.3	0.0		
Delay (s)		18.5	21.1								6.3	1.5		
Level of Service		B	C								A	A		
Approach Delay (s)		19.4			0.0			0.0			5.4			
Approach LOS		B			A			A			A			
<b>Intersection Summary</b>														
HCM Average Control Delay			8.1									HCM Level of Service	A	
HCM Volume to Capacity ratio			0.79											
Actuated Cycle Length (s)			60.0								15.0		Sum of lost time (s)	
Intersection Capacity Utilization			60.4%										ICU Level of Service	B
Analysis Period (min)			15											
c	Critical Lane Group													

# HCM Signalized Intersection Capacity Analysis





















## 102: Hilltop Needmore Rd & US 401 NB Lanes

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 				
Volume (vph)	275	0	0	0	0	204	0	1708	82	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					2.0		5.0	5.0			
Lane Util. Factor	0.97					1.00		0.95	1.00			
Frt	1.00					0.86		1.00	0.85			
Flt Protected	0.95					1.00		1.00	1.00			
Satd. Flow (prot)	3433					1611		3539	1583			
Flt Permitted	0.95					1.00		1.00	1.00			
Satd. Flow (perm)	3433					1611		3539	1583			
Peak-hour factor, 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
Adj. Flow (vph)	306	0	0	0	0	227	0	1898	91	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	306	0	0	0	0	227	0	1898	91	0	0	0
Turn Type	Prot					Free			Perm			
Protected Phases	7 8							2				
Permitted Phases						Free			2			
Actuated Green, G (s)	16.7					90.0		59.3	59.3			
Effective Green, g (s)	16.7					90.0		61.3	61.3			
Actuated g/C Ratio	0.19					1.00		0.68	0.68			
Clearance Time (s)								7.0	7.0			
Vehicle Extension (s)								2.0	2.0			
Lane Grp Cap (vph)	637					1611		2410	1078			
v/s Ratio Prot	c0.09							c0.54				
v/s Ratio Perm						0.14			0.06			
v/c Ratio	0.48					0.14		0.79	0.08			
Uniform Delay, d1	32.8					0.0		9.9	4.9			
Progression Factor	0.04					1.00		0.39	0.54			
Incremental Delay, d2	0.5					0.2		2.0	0.1			
Delay (s)	1.8					0.2		5.8	2.7			
Level of Service	A					A		A	A			
Approach Delay (s)		1.8			0.2			5.7			0.0	
Approach LOS		A			A			A			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			4.7			HCM Level of Service			A			
HCM Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			15.0			
Intersection Capacity Utilization			63.4%			ICU Level of Service			B			
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis  
 102: Hilltop Needmore Rd & US 401 NB Lanes




















7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	  							  				
Volume (vph)	370	0	0	0	0	275	0	2300	109	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					2.0		5.0	5.0			
Lane Util. Factor	0.94					1.00		0.91	1.00			
Frt	1.00					0.86		1.00	0.85			
Flt Protected	0.95					1.00		1.00	1.00			
Satd. Flow (prot)	4990					1611		5085	1583			
Flt Permitted	0.95					1.00		1.00	1.00			
Satd. Flow (perm)	4990					1611		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	411	0	0	0	0	306	0	2556	121	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	411	0	0	0	0	306	0	2556	121	0	0	0
Turn Type	Prot					Free			Perm			
Protected Phases	7 8							2				
Permitted Phases						Free			2			
Actuated Green, G (s)	16.0					60.0		33.0	33.0			
Effective Green, g (s)	18.0					60.0		35.0	35.0			
Actuated g/C Ratio	0.30					1.00		0.58	0.58			
Clearance Time (s)								7.0	7.0			
Vehicle Extension (s)								2.0	2.0			
Lane Grp Cap (vph)	1497					1611		2966	923			
v/s Ratio Prot	c0.08							c0.50				
v/s Ratio Perm						0.19			0.08			
v/c Ratio	0.27					0.19		0.86	0.13			
Uniform Delay, d1	16.0					0.0		10.5	5.6			
Progression Factor	0.00					1.00		0.35	0.27			
Incremental Delay, d2	0.1					0.3		2.8	0.2			
Delay (s)	0.1					0.3		6.5	1.7			
Level of Service	A					A		A	A			
Approach Delay (s)		0.1			0.3			6.3			0.0	
Approach LOS		A			A			A			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			5.0			HCM Level of Service			A			
HCM Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			60.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			59.8%			ICU Level of Service			B			
Analysis Period (min)			15									
c	Critical Lane Group											



HCM Signalized Intersection Capacity Analysis  
 102: Hilltop Needmore Rd & US 401 NB Lanes





















7/5/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	 							 					
Volume (vph)	299	0	0	0	0	180	0	855	137	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0					2.0		5.0	5.0				
Lane Util. Factor	0.97					1.00		0.95	1.00				
Frt	1.00					0.86		1.00	0.85				
Flt Protected	0.95					1.00		1.00	1.00				
Satd. Flow (prot)	3433					1611		3539	1583				
Flt Permitted	0.95					1.00		1.00	1.00				
Satd. Flow (perm)	3433					1611		3539	1583				
Peak-hour factor, 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	
Adj. Flow (vph)	332	0	0	0	0	200	0	950	152	0	0	0	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	332	0	0	0	0	200	0	950	152	0	0	0	
Turn Type	Prot					Free			Perm				
Protected Phases	7 8							2					
Permitted Phases						Free			2				
Actuated Green, G (s)	19.0					60.0		30.0	30.0				
Effective Green, g (s)	21.0					60.0		32.0	32.0				
Actuated g/C Ratio	0.35					1.00		0.53	0.53				
Clearance Time (s)								7.0	7.0				
Vehicle Extension (s)								2.0	2.0				
Lane Grp Cap (vph)	1202					1611		1887	844				
v/s Ratio Prot	c0.10							c0.27					
v/s Ratio Perm						0.12			0.10				
v/c Ratio	0.28					0.12		0.50	0.18				
Uniform Delay, d1	14.0					0.0		8.9	7.2				
Progression Factor	0.01					1.00		0.52	0.47				
Incremental Delay, d2	0.1					0.2		0.9	0.4				
Delay (s)	0.2					0.2		5.6	3.8				
Level of Service	A					A		A	A				
Approach Delay (s)		0.2			0.2			5.3			0.0		
Approach LOS		A			A			A			A		
<b>Intersection Summary</b>													
HCM Average Control Delay			3.7			HCM Level of Service			A				
HCM Volume to Capacity ratio			0.44										
Actuated Cycle Length (s)			60.0			Sum of lost time (s)			10.0				
Intersection Capacity Utilization			59.7%			ICU Level of Service			B				
Analysis Period (min)			15										
c	Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 102: Hilltop Needmore Rd & US 401 NB Lanes

7/5/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	  							  				
Volume (vph)	403	0	0	0	0	244	0	1153	185	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					2.0		5.0	5.0			
Lane Util. Factor	0.94					1.00		0.91	1.00			
Frt	1.00					0.86		1.00	0.85			
Flt Protected	0.95					1.00		1.00	1.00			
Satd. Flow (prot)	4990					1611		5085	1583			
Flt Permitted	0.95					1.00		1.00	1.00			
Satd. Flow (perm)	4990					1611		5085	1583			
Peak-hour factor, 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
Adj. Flow (vph)	448	0	0	0	0	271	0	1281	206	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	448	0	0	0	0	271	0	1281	206	0	0	0
Turn Type	Prot					Free			Perm			
Protected Phases	7 8							2				
Permitted Phases						Free			2			
Actuated Green, G (s)	23.0					60.0		26.0	26.0			
Effective Green, g (s)	25.0					60.0		28.0	28.0			
Actuated g/C Ratio	0.42					1.00		0.47	0.47			
Clearance Time (s)								7.0	7.0			
Vehicle Extension (s)								2.0	2.0			
Lane Grp Cap (vph)	2079					1611		2373	739			
v/s Ratio Prot	c0.09							c0.25				
v/s Ratio Perm						0.17			0.13			
v/c Ratio	0.22					0.17		0.54	0.28			
Uniform Delay, d1	11.2					0.0		11.4	9.8			
Progression Factor	0.00					1.00		0.51	0.47			
Incremental Delay, d2	0.1					0.2		0.8	0.9			
Delay (s)	0.1					0.2		6.7	5.5			
Level of Service	A					A		A	A			
Approach Delay (s)		0.1			0.2			6.5			0.0	
Approach LOS		A			A			A			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			4.4			HCM Level of Service			A			
HCM Volume to Capacity ratio			0.41									
Actuated Cycle Length (s)			60.0			Sum of lost time (s)			10.0			
Intersection Capacity Utilization			60.4%			ICU Level of Service			B			
Analysis Period (min)			15									
c	Critical Lane Group											

# HCM Signalized Intersection Capacity Analysis

## 201: North U-turn Median & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶↶					↷↷
Volume (vph)	149	0	0	0	0	897
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	166	0	0	0	0	997
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	166	0	0	0	0	997
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	9.7					66.3
Effective Green, g (s)	11.7					68.3
Actuated g/C Ratio	0.13					0.76
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	446					2686
v/s Ratio Prot	c0.05					c0.28
v/s Ratio Perm						
v/c Ratio	0.37					0.37
Uniform Delay, d1	35.8					3.6
Progression Factor	0.98					1.00
Incremental Delay, d2	0.4					0.4
Delay (s)	35.3					4.0
Level of Service	D					A
Approach Delay (s)	35.3		0.0			4.0
Approach LOS	D		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			8.5		HCM Level of Service	A
HCM Volume to Capacity ratio			0.37			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			88.6%		ICU Level of Service	E
Analysis Period (min)			15			
c	Critical Lane Group					

# HCM Signalized Intersection Capacity Analysis

## 201: North U-turn Median & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔					↑↑↑
Volume (vph)	199	0	0	0	0	1207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	221	0	0	0	0	1341
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	221	0	0	0	0	1341
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	9.2					36.8
Effective Green, g (s)	11.2					38.8
Actuated g/C Ratio	0.19					0.65
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	641					3288
v/s Ratio Prot	c0.06					c0.26
v/s Ratio Perm						
v/c Ratio	0.34					0.41
Uniform Delay, d1	21.2					5.1
Progression Factor	0.71					1.00
Incremental Delay, d2	0.2					0.4
Delay (s)	15.2					5.5
Level of Service	B					A
Approach Delay (s)	15.2		0.0		5.5	
Approach LOS	B		A		A	

### Intersection Summary

HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 201: North U-turn Median & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶↶					↷↷
Volume (vph)	191	0	0	0	0	1688
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					3539
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	212	0	0	0	0	1876
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	212	0	0	0	0	1876
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	9.1					36.9
Effective Green, g (s)	11.1					38.9
Actuated g/C Ratio	0.18					0.65
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	635					2294
v/s Ratio Prot	c0.06					c0.53
v/s Ratio Perm						
v/c Ratio	0.33					0.82
Uniform Delay, d1	21.2					7.9
Progression Factor	0.81					1.00
Incremental Delay, d2	0.3					3.4
Delay (s)	17.6					11.3
Level of Service	B					B
Approach Delay (s)	17.6		0.0			11.3
Approach LOS	B		A			B
<b>Intersection Summary</b>						
HCM Average Control Delay			11.9		HCM Level of Service	B
HCM Volume to Capacity ratio			0.71			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			85.8%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 201: North U-turn Median & US 401 SB Lanes

7/5/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	←←					→→→
Volume (vph)	259	0	0	0	0	2273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0					5.0
Lane Util. Factor	0.97					0.91
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3433					5085
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3433					5085
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	288	0	0	0	0	2526
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	288	0	0	0	0	2526
Turn Type						
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	10.2					35.8
Effective Green, g (s)	12.2					37.8
Actuated g/C Ratio	0.20					0.63
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	698					3204
v/s Ratio Prot	c0.08					c0.50
v/s Ratio Perm						
v/c Ratio	0.41					0.79
Uniform Delay, d1	20.8					8.2
Progression Factor	0.75					1.00
Incremental Delay, d2	0.4					2.0
Delay (s)	16.0					10.2
Level of Service	B					B
Approach Delay (s)	16.0		0.0			10.2
Approach LOS	B		A			B
<b>Intersection Summary</b>						
HCM Average Control Delay			10.8		HCM Level of Service	B
HCM Volume to Capacity ratio			0.70			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	10.0
Intersection Capacity Utilization			81.2%		ICU Level of Service	D
Analysis Period (min)			15			
c	Critical Lane Group					

## Appendix C: Traffic Volume Data

# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted by: L. Reid

File Name : US 401 @ Ten Ten

Site Code : 00000000

Start Date : 5/1/2013

Page No : 1

Weather: Rain

## Groups Printed- Unshifted - Bank 1 - Bank 2

Start Time	Southbound					Westbound					Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:00 AM	3	46	4	1	54	17	67	15	0	99	11	153	2	0	166	23	13	8	0	44	363
06:15 AM	8	61	16	0	85	23	98	39	0	160	5	218	7	1	231	19	22	8	0	49	525
06:30 AM	14	63	18	2	97	20	135	43	0	198	12	276	6	0	294	40	23	5	0	68	657
06:45 AM	14	93	27	0	134	21	121	56	0	198	25	288	6	0	319	37	28	12	0	77	728
<b>Total</b>	<b>39</b>	<b>263</b>	<b>65</b>	<b>3</b>	<b>370</b>	<b>81</b>	<b>421</b>	<b>153</b>	<b>0</b>	<b>655</b>	<b>53</b>	<b>935</b>	<b>21</b>	<b>1</b>	<b>1010</b>	<b>119</b>	<b>86</b>	<b>33</b>	<b>0</b>	<b>238</b>	<b>2273</b>
07:00 AM	12	71	13	5	101	15	111	85	0	211	16	341	8	1	366	59	32	15	0	106	784
07:15 AM	32	136	10	0	178	20	126	68	0	214	16	299	11	0	326	57	52	21	0	130	848
07:30 AM	36	137	12	1	186	20	116	94	0	230	13	351	16	1	381	70	41	21	0	132	929
07:45 AM	37	181	18	0	236	28	92	62	0	182	15	396	19	1	431	60	44	21	0	125	974
<b>Total</b>	<b>117</b>	<b>525</b>	<b>53</b>	<b>6</b>	<b>701</b>	<b>83</b>	<b>445</b>	<b>309</b>	<b>0</b>	<b>837</b>	<b>60</b>	<b>1387</b>	<b>54</b>	<b>3</b>	<b>1504</b>	<b>246</b>	<b>169</b>	<b>78</b>	<b>0</b>	<b>493</b>	<b>3535</b>
08:00 AM	32	108	16	3	159	21	101	43	0	165	17	344	21	2	384	65	43	19	0	127	835
08:15 AM	28	120	16	2	166	26	101	33	0	160	29	295	16	1	341	54	66	22	0	142	809
08:30 AM	7	134	21	2	164	37	102	29	0	168	31	215	13	3	262	40	44	31	0	115	709
08:45 AM	23	128	15	3	169	23	84	22	0	129	16	170	15	3	204	45	42	31	0	118	620
<b>Total</b>	<b>90</b>	<b>490</b>	<b>68</b>	<b>10</b>	<b>658</b>	<b>107</b>	<b>388</b>	<b>127</b>	<b>0</b>	<b>622</b>	<b>93</b>	<b>1024</b>	<b>65</b>	<b>9</b>	<b>1191</b>	<b>204</b>	<b>195</b>	<b>103</b>	<b>0</b>	<b>502</b>	<b>2973</b>
09:00 AM	27	123	19	2	171	35	91	25	0	151	39	170	7	3	219	48	58	42	0	148	689
09:15 AM	23	160	17	5	205	55	76	13	0	144	41	115	9	3	168	38	95	70	0	203	720
09:30 AM	36	210	12	5	263	34	60	19	0	113	27	119	15	0	161	52	65	98	0	215	752
09:45 AM	28	130	17	1	176	32	56	15	0	103	31	128	15	2	176	27	39	34	0	100	555
<b>Total</b>	<b>114</b>	<b>623</b>	<b>65</b>	<b>13</b>	<b>815</b>	<b>156</b>	<b>283</b>	<b>72</b>	<b>0</b>	<b>511</b>	<b>138</b>	<b>532</b>	<b>46</b>	<b>8</b>	<b>724</b>	<b>165</b>	<b>257</b>	<b>244</b>	<b>0</b>	<b>666</b>	<b>2716</b>
10:00 AM	15	104	15	3	137	18	42	14	0	74	21	134	15	2	172	29	32	13	0	74	457
10:15 AM	22	101	15	2	140	21	55	19	0	95	31	151	13	2	197	24	31	11	0	66	498
10:30 AM	20	109	12	1	142	18	51	18	0	87	27	149	11	1	188	26	37	12	0	75	492
10:45 AM	21	85	21	5	132	23	54	13	0	90	39	123	14	0	176	25	41	17	0	83	481
<b>Total</b>	<b>78</b>	<b>399</b>	<b>63</b>	<b>11</b>	<b>551</b>	<b>80</b>	<b>202</b>	<b>64</b>	<b>0</b>	<b>346</b>	<b>118</b>	<b>557</b>	<b>53</b>	<b>5</b>	<b>733</b>	<b>104</b>	<b>141</b>	<b>53</b>	<b>0</b>	<b>298</b>	<b>1928</b>
11:00 AM	29	106	16	10	161	22	57	19	0	98	48	126	6	1	181	32	41	16	0	89	529
11:15 AM	31	106	12	2	151	25	48	21	0	94	51	131	13	1	196	36	48	22	0	106	547
11:30 AM	31	98	23	6	158	23	52	13	0	88	45	145	15	2	207	28	59	30	0	117	570
11:45 AM	34	112	10	7	163	25	52	16	1	94	43	141	16	4	204	28	45	28	0	101	562
<b>Total</b>	<b>125</b>	<b>422</b>	<b>61</b>	<b>25</b>	<b>633</b>	<b>95</b>	<b>209</b>	<b>69</b>	<b>1</b>	<b>374</b>	<b>187</b>	<b>543</b>	<b>50</b>	<b>8</b>	<b>788</b>	<b>124</b>	<b>193</b>	<b>96</b>	<b>0</b>	<b>413</b>	<b>2208</b>
12:00 PM	40	124	15	5	184	27	52	17	0	96	55	156	20	5	236	36	61	49	0	146	662
12:15 PM	28	134	7	8	177	33	43	21	0	97	49	162	19	0	230	35	59	51	0	145	649
12:30 PM	21	124	19	2	166	32	71	23	0	126	54	153	18	2	227	27	52	24	0	103	622
12:45 PM	30	118	16	7	171	25	56	16	0	97	43	138	15	4	200	26	76	18	0	120	588
<b>Total</b>	<b>119</b>	<b>500</b>	<b>57</b>	<b>22</b>	<b>698</b>	<b>117</b>	<b>222</b>	<b>77</b>	<b>0</b>	<b>416</b>	<b>201</b>	<b>609</b>	<b>72</b>	<b>11</b>	<b>893</b>	<b>124</b>	<b>248</b>	<b>142</b>	<b>0</b>	<b>514</b>	<b>2521</b>
01:00 PM	32	104	16	5	157	32	37	23	0	92	40	152	15	4	211	35	64	12	0	111	571
01:15 PM	36	107	18	5	166	29	46	20	0	95	36	168	11	0	215	25	63	10	0	98	574
01:30 PM	28	96	25	10	159	32	58	13	0	103	36	127	19	3	185	28	68	23	0	119	566
01:45 PM	37	114	17	5	173	27	57	20	0	104	38	141	24	1	204	37	37	21	0	95	576
<b>Total</b>	<b>133</b>	<b>421</b>	<b>76</b>	<b>25</b>	<b>655</b>	<b>120</b>	<b>198</b>	<b>76</b>	<b>0</b>	<b>394</b>	<b>150</b>	<b>588</b>	<b>69</b>	<b>8</b>	<b>815</b>	<b>125</b>	<b>232</b>	<b>66</b>	<b>0</b>	<b>423</b>	<b>2287</b>
02:00 PM	29	115	14	5	163	25	52	24	0	101	35	159	17	4	215	22	57	24	0	103	582
02:15 PM	33	138	20	0	191	23	68	17	0	108	42	145	10	3	200	27	57	25	0	109	608
02:30 PM	30	122	23	3	178	24	71	21	0	116	41	145	11	1	198	59	62	27	0	148	640
02:45 PM	32	118	22	2	174	32	58	28	0	118	41	174	14	1	230	36	63	30	0	129	651
<b>Total</b>	<b>124</b>	<b>493</b>	<b>79</b>	<b>10</b>	<b>706</b>	<b>104</b>	<b>249</b>	<b>90</b>	<b>0</b>	<b>443</b>	<b>159</b>	<b>623</b>	<b>52</b>	<b>9</b>	<b>843</b>	<b>144</b>	<b>239</b>	<b>106</b>	<b>0</b>	<b>489</b>	<b>2481</b>
03:00 PM	36	162	23	1	222	28	52	23	0	103	52	172	9	1	234	38	73	54	0	165	724
03:15 PM	63	169	21	6	259	31	51	21	0	103	36	144	14	2	196	35	103	33	0	171	729
03:30 PM	49	180	20	2	251	23	50	16	0	89	34	150	17	0	201	37	128	27	0	192	733
03:45 PM	51	195	27	2	275	33	50	20	0	103	31	138	20	1	190	41	96	24	0	161	729
<b>Total</b>	<b>199</b>	<b>706</b>	<b>91</b>	<b>11</b>	<b>1007</b>	<b>115</b>	<b>203</b>	<b>80</b>	<b>0</b>	<b>398</b>	<b>153</b>	<b>604</b>	<b>60</b>	<b>4</b>	<b>821</b>	<b>151</b>	<b>400</b>	<b>138</b>	<b>0</b>	<b>689</b>	<b>2915</b>
04:00 PM	45	191	30	6	272	37	45	19	0	101	46	152	22	1	221	27	107	24	0	158	752
04:15 PM	79	258	25	3	365	37	58	13	0	108	39	155	20	2	216	40	112	28	0	180	869
04:30 PM	76	202	30	4	312	39	76	17	0	132	47	180	31	0	258	48	126	24	0	198	900
04:45 PM	63	288	28	5	384	37	83	17	0	137	37	167	24	2	230	31	128	22	0	181	932
<b>Total</b>	<b>263</b>	<b>939</b>	<b>113</b>	<b>18</b>	<b>1333</b>	<b>150</b>	<b>262</b>	<b>66</b>	<b>0</b>	<b>478</b>	<b>169</b>	<b>654</b>	<b>97</b>	<b>5</b>	<b>925</b>	<b>146</b>	<b>473</b>	<b>98</b>	<b>0</b>	<b>717</b>	<b>3453</b>



# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted by: L. Reid

File Name : US 401 @ Ten Ten

Site Code : 00000000

Start Date : 5/1/2013

Page No : 2

Weather: Rain

## Groups Printed- Unshifted - Bank 1 - Bank 2

Start Time	Southbound					Westbound					Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
05:00 PM	69	256	35	1	361	39	73	17	1	130	54	213	41	2	310	29	128	34	0	191	992
05:15 PM	85	333	38	0	456	42	83	21	0	146	66	218	27	4	315	35	126	28	0	189	1106
05:30 PM	78	288	38	0	404	48	64	19	0	131	50	172	33	2	257	44	128	32	0	204	996
05:45 PM	82	342	33	2	459	51	76	24	0	151	43	166	21	1	231	38	113	34	0	185	1026
<b>Total</b>	<b>314</b>	<b>1219</b>	<b>144</b>	<b>3</b>	<b>1680</b>	<b>180</b>	<b>296</b>	<b>81</b>	<b>1</b>	<b>558</b>	<b>213</b>	<b>769</b>	<b>122</b>	<b>9</b>	<b>1113</b>	<b>146</b>	<b>495</b>	<b>128</b>	<b>0</b>	<b>769</b>	<b>4120</b>
06:00 PM	75	278	39	2	394	29	70	21	1	121	29	178	24	3	234	33	115	29	0	177	926
06:15 PM	62	194	35	2	293	39	96	23	0	158	48	170	23	3	244	55	129	26	0	210	905
06:30 PM	67	146	21	2	236	40	80	28	1	149	26	176	23	4	229	48	110	9	0	167	781
06:45 PM	57	136	20	2	215	41	79	20	0	140	30	157	17	1	205	37	108	14	0	159	719
<b>Total</b>	<b>261</b>	<b>754</b>	<b>115</b>	<b>8</b>	<b>1138</b>	<b>149</b>	<b>325</b>	<b>92</b>	<b>2</b>	<b>568</b>	<b>133</b>	<b>681</b>	<b>87</b>	<b>11</b>	<b>912</b>	<b>173</b>	<b>462</b>	<b>78</b>	<b>0</b>	<b>713</b>	<b>3331</b>
07:00 PM	45	121	22	3	191	27	58	27	0	112	31	124	14	4	173	22	82	17	0	121	597
07:15 PM	54	106	11	2	173	23	38	30	0	91	34	111	16	0	161	34	79	10	0	123	548
07:30 PM	45	105	22	2	174	14	40	18	0	72	29	87	8	0	124	30	69	9	0	108	478
07:45 PM	42	108	14	5	169	36	43	8	1	88	15	81	16	0	112	16	41	6	0	63	432
<b>Total</b>	<b>186</b>	<b>440</b>	<b>69</b>	<b>12</b>	<b>707</b>	<b>100</b>	<b>179</b>	<b>83</b>	<b>1</b>	<b>363</b>	<b>109</b>	<b>403</b>	<b>54</b>	<b>4</b>	<b>570</b>	<b>102</b>	<b>271</b>	<b>42</b>	<b>0</b>	<b>415</b>	<b>2055</b>
08:00 PM	21	104	16	5	146	18	29	11	0	58	23	74	13	0	110	22	61	6	0	89	403
08:15 PM	36	104	10	3	153	22	31	7	0	60	19	97	13	1	130	16	81	9	0	106	449
08:30 PM	36	107	14	0	157	22	30	4	0	56	22	81	9	1	113	24	58	6	0	88	414
08:45 PM	40	73	22	3	138	20	29	8	0	57	14	85	11	0	110	17	43	6	0	66	371
<b>Total</b>	<b>133</b>	<b>388</b>	<b>62</b>	<b>11</b>	<b>594</b>	<b>82</b>	<b>119</b>	<b>30</b>	<b>0</b>	<b>231</b>	<b>78</b>	<b>337</b>	<b>46</b>	<b>2</b>	<b>463</b>	<b>79</b>	<b>243</b>	<b>27</b>	<b>0</b>	<b>349</b>	<b>1637</b>
09:00 PM	27	76	10	2	115	11	27	7	0	45	22	76	11	1	110	9	53	9	0	71	341
09:15 PM	50	93	14	6	163	22	17	11	0	50	10	83	5	1	99	11	43	0	0	54	366
09:30 PM	28	69	9	0	106	9	12	11	0	32	9	50	5	0	64	9	42	6	0	57	259
09:45 PM	23	65	11	3	102	8	12	2	0	22	11	39	9	1	60	7	41	3	0	51	235
<b>Total</b>	<b>128</b>	<b>303</b>	<b>44</b>	<b>11</b>	<b>486</b>	<b>50</b>	<b>68</b>	<b>31</b>	<b>0</b>	<b>149</b>	<b>52</b>	<b>248</b>	<b>30</b>	<b>3</b>	<b>333</b>	<b>36</b>	<b>179</b>	<b>18</b>	<b>0</b>	<b>233</b>	<b>1201</b>
<b>Grand Total</b>	<b>2423</b>	<b>8885</b>	<b>1225</b>	<b>199</b>	<b>12732</b>	<b>1769</b>	<b>4069</b>	<b>1500</b>	<b>5</b>	<b>7343</b>	<b>2066</b>	<b>10494</b>	<b>978</b>	<b>100</b>	<b>13638</b>	<b>2188</b>	<b>4283</b>	<b>1450</b>	<b>0</b>	<b>7921</b>	<b>41634</b>
Apprch %	19	69.8	9.6	1.6		24.1	55.4	20.4	0.1		15.1	76.9	7.2	0.7		27.6	54.1	18.3	0		
Total %	5.8	21.3	2.9	0.5	30.6	4.2	9.8	3.6	0	17.6	5	25.2	2.3	0.2	32.8	5.3	10.3	3.5	0	19	
Unshifted	2412	8657	1202	155	12426	1745	4042	1497	4	7288	2032	10267	962	78	13339	2150	4243	1418	0	7811	40864
% Unshifted	99.5	97.4	98.1	77.9	97.6	98.6	99.3	99.8	80	99.3	98.4	97.6	98.4	78	97.8	98.3	99.1	97.8	0	98.6	98.2
% Bank 1	9	227	21	3	260	24	26	3	0	53	33	227	15	3	278	38	38	32	0	108	699
% Bank 1	0.4	2.6	1.7	1.5	2	1.4	0.6	0.2	0	0.7	1.6	2.2	1.5	3	2	1.7	0.9	2.2	0	1.4	1.7
% Bank 2	2	1	2	41	46	0	1	0	1	2	1	0	1	19	21	0	2	0	0	2	71
% Bank 2	0.1	0	0.2	20.6	0.4	0	0	0	20	0	0	0	0.1	19	0.2	0	0	0	0	0	0.2

# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted by: L. Reid

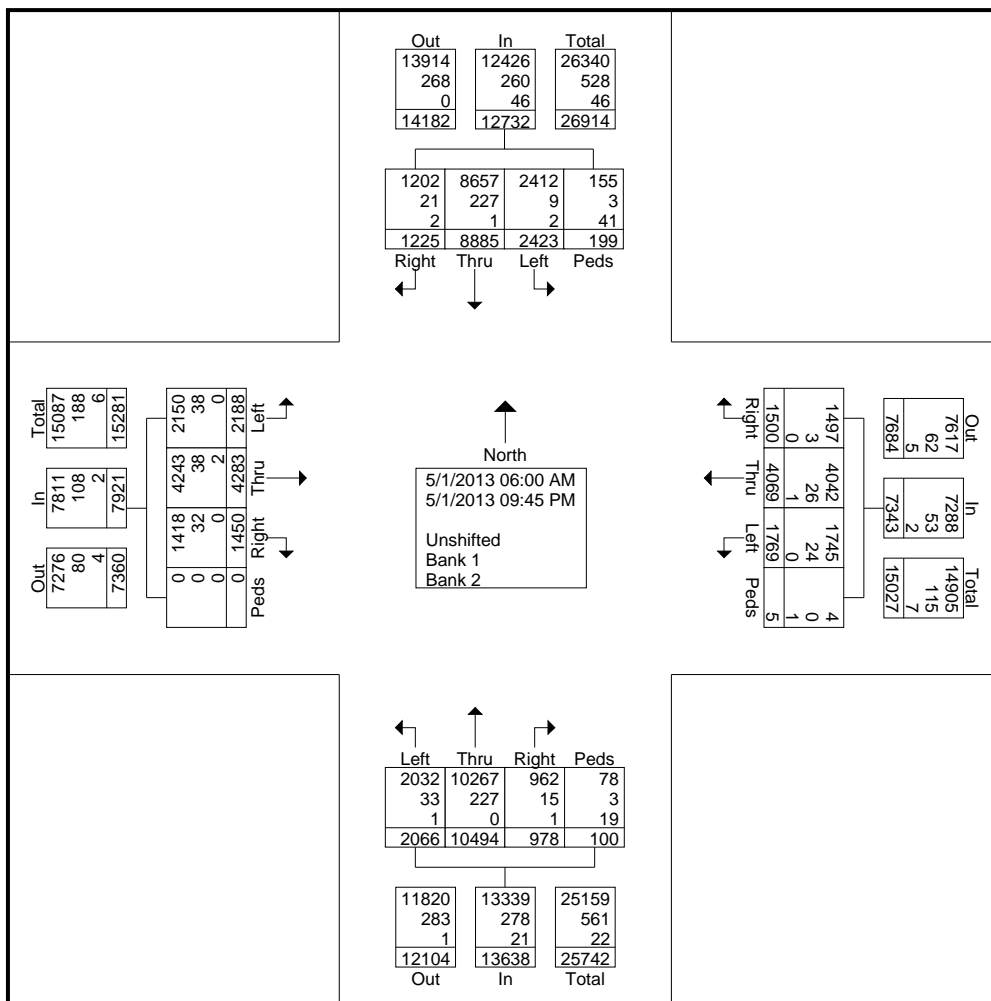
File Name : US 401 @ Ten Ten

Site Code : 00000000

Start Date : 5/1/2013

Page No : 3

Weather: Rain



# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted by: L. Reid

File Name : US 401 @ Ten Ten

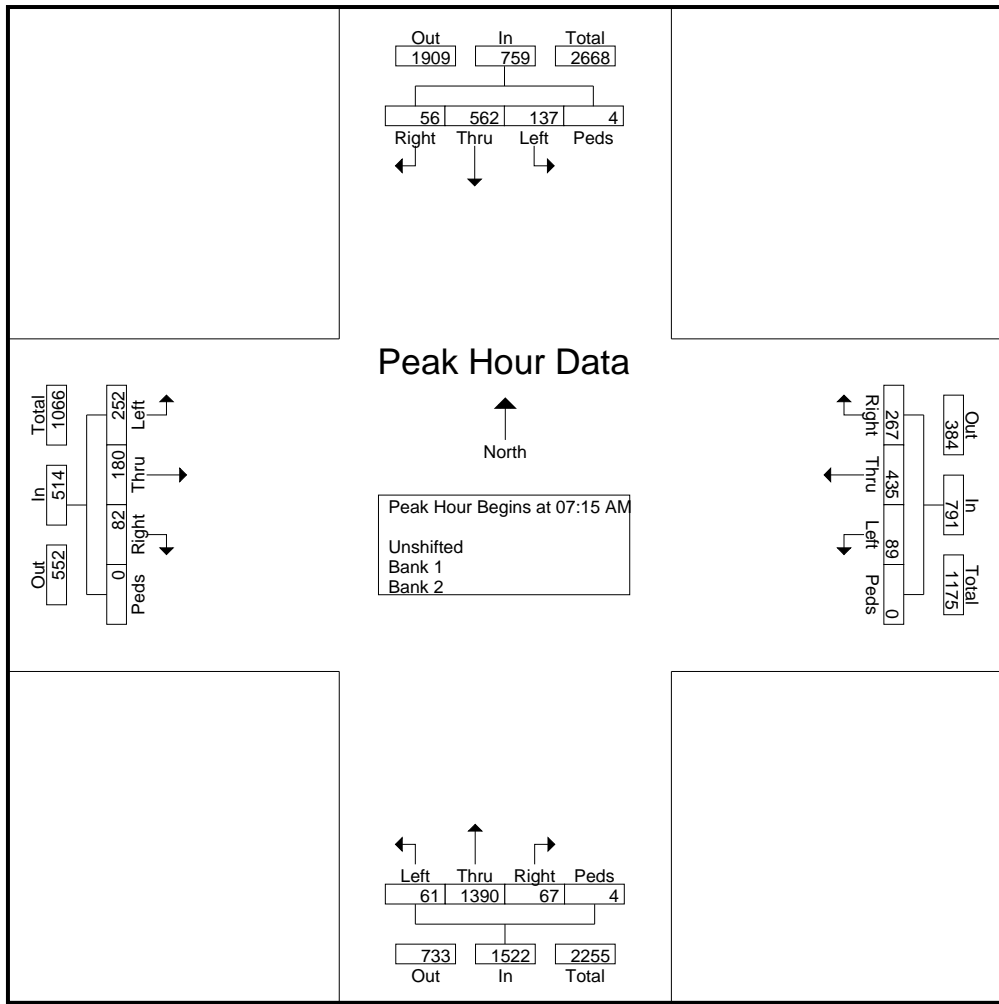
Site Code : 00000000

Start Date : 5/1/2013

Page No : 4

Weather: Rain

Start Time	Southbound					Westbound					Northbound					Eastbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 07:15 AM																						
07:15 AM	32	136	10	0	178	20	126	68	0	214	16	299	11	0	326	57	52	21	0	130	848	
07:30 AM	36	137	12	1	186	20	116	94	0	230	13	351	16	1	381	70	41	21	0	132	929	
07:45 AM	37	181	18	0	236	28	92	62	0	182	15	396	19	1	431	60	44	21	0	125	974	
08:00 AM	32	108	16	3	159	21	101	43	0	165	17	344	21	2	384	65	43	19	0	127	835	
Total Volume	137	562	56	4	759	89	435	267	0	791	61	1390	67	4	1522	252	180	82	0	514	3586	
% App. Total	PHF	.926	.776	.778	.333	.804	.795	.863	.710	.000	.860	.897	.878	.798	.500	.883	.900	.865	.976	.000	.973	.920



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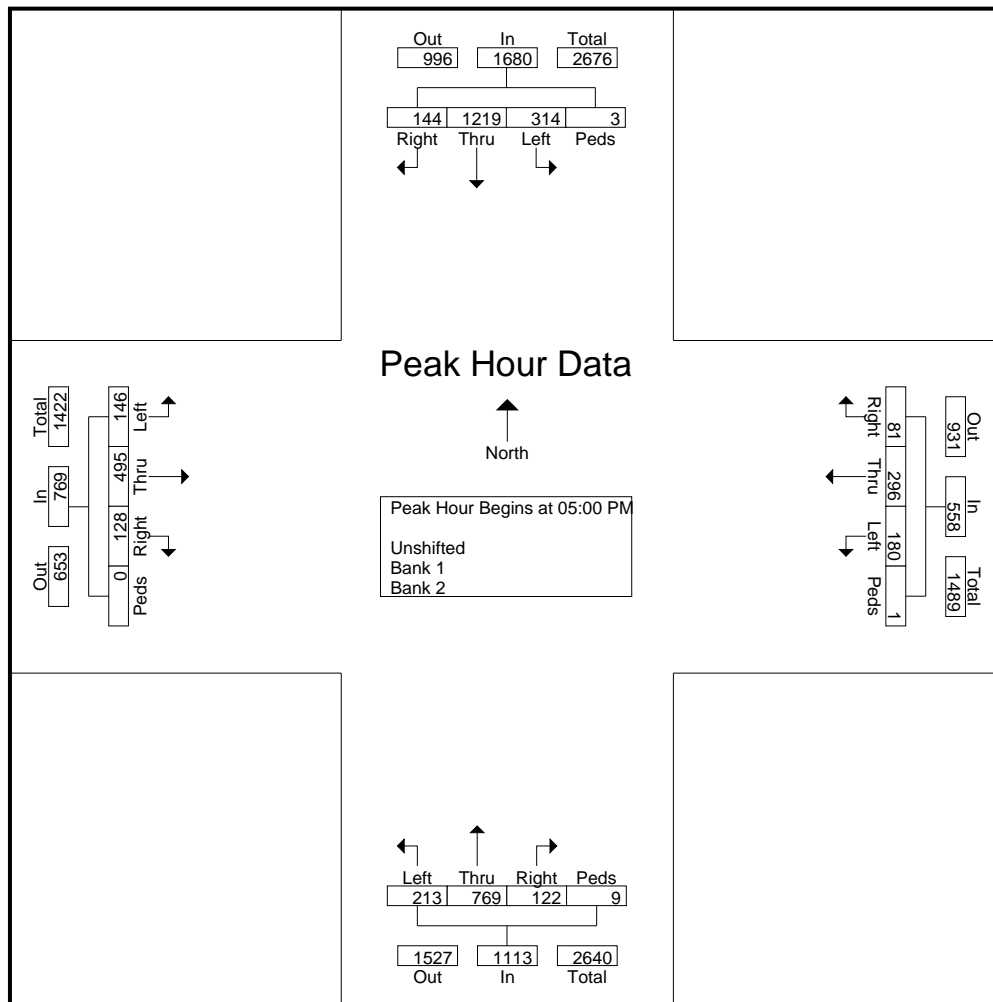
Site Code : 00000000

Start Date : 5/1/2013

Page No : 5

Weather: Rain

Start Time	Southbound					Westbound					Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 12:00 PM to 09:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	69	256	35	1	361	39	73	17	1	130	54	213	41	2	310	29	128	34	0	191	992
05:15 PM	85	333	38	0	456	42	83	21	0	146	66	218	27	4	315	35	126	28	0	189	1106
05:30 PM	78	288	38	0	404	48	64	19	0	131	50	172	33	2	257	44	128	32	0	204	996
05:45 PM	82	342	33	2	459	51	76	24	0	151	43	166	21	1	231	38	113	34	0	185	1026
Total Volume	314	1219	144	3	1680	180	296	81	1	558	213	769	122	9	1113	146	495	128	0	769	4120
% App. Total	18.7	72.6	8.6	0.2		32.3	53	14.5	0.2		19.1	69.1	11	0.8		19	64.4	16.6	0		
PHF	.924	.891	.947	.375	.915	.882	.892	.844	.250	.924	.807	.882	.744	.563	.883	.830	.967	.941	.000	.942	.931



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Counted by: L. Reid

File Name : US 401 @ Ten Ten

Site Code : 00000000

Start Date : 5/1/2013

Page No : 1

Weather: Rain

## Groups Printed- Unshifted - Bank 1 - Bank 2

Start Time	Southbound					Westbound					Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:00 AM	3	46	4	1	54	17	67	15	0	99	11	153	2	0	166	23	13	8	0	44	363
06:15 AM	8	61	16	0	85	23	98	39	0	160	5	218	7	1	231	19	22	8	0	49	525
06:30 AM	14	63	18	2	97	20	135	43	0	198	12	276	6	0	294	40	23	5	0	68	657
06:45 AM	14	93	27	0	134	21	121	56	0	198	25	288	6	0	319	37	28	12	0	77	728
<b>Total</b>	<b>39</b>	<b>263</b>	<b>65</b>	<b>3</b>	<b>370</b>	<b>81</b>	<b>421</b>	<b>153</b>	<b>0</b>	<b>655</b>	<b>53</b>	<b>935</b>	<b>21</b>	<b>1</b>	<b>1010</b>	<b>119</b>	<b>86</b>	<b>33</b>	<b>0</b>	<b>238</b>	<b>2273</b>
07:00 AM	12	71	13	5	101	15	111	85	0	211	16	341	8	1	366	59	32	15	0	106	784
07:15 AM	32	136	10	0	178	20	126	68	0	214	16	299	11	0	326	57	52	21	0	130	848
07:30 AM	36	137	12	1	186	20	116	94	0	230	13	351	16	1	381	70	41	21	0	132	929
07:45 AM	37	181	18	0	236	28	92	62	0	182	15	396	19	1	431	60	44	21	0	125	974
<b>Total</b>	<b>117</b>	<b>525</b>	<b>53</b>	<b>6</b>	<b>701</b>	<b>83</b>	<b>445</b>	<b>309</b>	<b>0</b>	<b>837</b>	<b>60</b>	<b>1387</b>	<b>54</b>	<b>3</b>	<b>1504</b>	<b>246</b>	<b>169</b>	<b>78</b>	<b>0</b>	<b>493</b>	<b>3535</b>
08:00 AM	32	108	16	3	159	21	101	43	0	165	17	344	21	2	384	65	43	19	0	127	835
08:15 AM	28	120	16	2	166	26	101	33	0	160	29	295	16	1	341	54	66	22	0	142	809
08:30 AM	7	134	21	2	164	37	102	29	0	168	31	215	13	3	262	40	44	31	0	115	709
08:45 AM	23	128	15	3	169	23	84	22	0	129	16	170	15	3	204	45	42	31	0	118	620
<b>Total</b>	<b>90</b>	<b>490</b>	<b>68</b>	<b>10</b>	<b>658</b>	<b>107</b>	<b>388</b>	<b>127</b>	<b>0</b>	<b>622</b>	<b>93</b>	<b>1024</b>	<b>65</b>	<b>9</b>	<b>1191</b>	<b>204</b>	<b>195</b>	<b>103</b>	<b>0</b>	<b>502</b>	<b>2973</b>
09:00 AM	27	123	19	2	171	35	91	25	0	151	39	170	7	3	219	48	58	42	0	148	689
09:15 AM	23	160	17	5	205	55	76	13	0	144	41	115	9	3	168	38	95	70	0	203	720
09:30 AM	36	210	12	5	263	34	60	19	0	113	27	119	15	0	161	52	65	98	0	215	752
09:45 AM	28	130	17	1	176	32	56	15	0	103	31	128	15	2	176	27	39	34	0	100	555
<b>Total</b>	<b>114</b>	<b>623</b>	<b>65</b>	<b>13</b>	<b>815</b>	<b>156</b>	<b>283</b>	<b>72</b>	<b>0</b>	<b>511</b>	<b>138</b>	<b>532</b>	<b>46</b>	<b>8</b>	<b>724</b>	<b>165</b>	<b>257</b>	<b>244</b>	<b>0</b>	<b>666</b>	<b>2716</b>
10:00 AM	15	104	15	3	137	18	42	14	0	74	21	134	15	2	172	29	32	13	0	74	457
10:15 AM	22	101	15	2	140	21	55	19	0	95	31	151	13	2	197	24	31	11	0	66	498
10:30 AM	20	109	12	1	142	18	51	18	0	87	27	149	11	1	188	26	37	12	0	75	492
10:45 AM	21	85	21	5	132	23	54	13	0	90	39	123	14	0	176	25	41	17	0	83	481
<b>Total</b>	<b>78</b>	<b>399</b>	<b>63</b>	<b>11</b>	<b>551</b>	<b>80</b>	<b>202</b>	<b>64</b>	<b>0</b>	<b>346</b>	<b>118</b>	<b>557</b>	<b>53</b>	<b>5</b>	<b>733</b>	<b>104</b>	<b>141</b>	<b>53</b>	<b>0</b>	<b>298</b>	<b>1928</b>
11:00 AM	29	106	16	10	161	22	57	19	0	98	48	126	6	1	181	32	41	16	0	89	529
11:15 AM	31	106	12	2	151	25	48	21	0	94	51	131	13	1	196	36	48	22	0	106	547
11:30 AM	31	98	23	6	158	23	52	13	0	88	45	145	15	2	207	28	59	30	0	117	570
11:45 AM	34	112	10	7	163	25	52	16	1	94	43	141	16	4	204	28	45	28	0	101	562
<b>Total</b>	<b>125</b>	<b>422</b>	<b>61</b>	<b>25</b>	<b>633</b>	<b>95</b>	<b>209</b>	<b>69</b>	<b>1</b>	<b>374</b>	<b>187</b>	<b>543</b>	<b>50</b>	<b>8</b>	<b>788</b>	<b>124</b>	<b>193</b>	<b>96</b>	<b>0</b>	<b>413</b>	<b>2208</b>
12:00 PM	40	124	15	5	184	27	52	17	0	96	55	156	20	5	236	36	61	49	0	146	662
12:15 PM	28	134	7	8	177	33	43	21	0	97	49	162	19	0	230	35	59	51	0	145	649
12:30 PM	21	124	19	2	166	32	71	23	0	126	54	153	18	2	227	27	52	24	0	103	622
12:45 PM	30	118	16	7	171	25	56	16	0	97	43	138	15	4	200	26	76	18	0	120	588
<b>Total</b>	<b>119</b>	<b>500</b>	<b>57</b>	<b>22</b>	<b>698</b>	<b>117</b>	<b>222</b>	<b>77</b>	<b>0</b>	<b>416</b>	<b>201</b>	<b>609</b>	<b>72</b>	<b>11</b>	<b>893</b>	<b>124</b>	<b>248</b>	<b>142</b>	<b>0</b>	<b>514</b>	<b>2521</b>
01:00 PM	32	104	16	5	157	32	37	23	0	92	40	152	15	4	211	35	64	12	0	111	571
01:15 PM	36	107	18	5	166	29	46	20	0	95	36	168	11	0	215	25	63	10	0	98	574
01:30 PM	28	96	25	10	159	32	58	13	0	103	36	127	19	3	185	28	68	23	0	119	566
01:45 PM	37	114	17	5	173	27	57	20	0	104	38	141	24	1	204	37	37	21	0	95	576
<b>Total</b>	<b>133</b>	<b>421</b>	<b>76</b>	<b>25</b>	<b>655</b>	<b>120</b>	<b>198</b>	<b>76</b>	<b>0</b>	<b>394</b>	<b>150</b>	<b>588</b>	<b>69</b>	<b>8</b>	<b>815</b>	<b>125</b>	<b>232</b>	<b>66</b>	<b>0</b>	<b>423</b>	<b>2287</b>
02:00 PM	29	115	14	5	163	25	52	24	0	101	35	159	17	4	215	22	57	24	0	103	582
02:15 PM	33	138	20	0	191	23	68	17	0	108	42	145	10	3	200	27	57	25	0	109	608
02:30 PM	30	122	23	3	178	24	71	21	0	116	41	145	11	1	198	59	62	27	0	148	640
02:45 PM	32	118	22	2	174	32	58	28	0	118	41	174	14	1	230	36	63	30	0	129	651
<b>Total</b>	<b>124</b>	<b>493</b>	<b>79</b>	<b>10</b>	<b>706</b>	<b>104</b>	<b>249</b>	<b>90</b>	<b>0</b>	<b>443</b>	<b>159</b>	<b>623</b>	<b>52</b>	<b>9</b>	<b>843</b>	<b>144</b>	<b>239</b>	<b>106</b>	<b>0</b>	<b>489</b>	<b>2481</b>
03:00 PM	36	162	23	1	222	28	52	23	0	103	52	172	9	1	234	38	73	54	0	165	724
03:15 PM	63	169	21	6	259	31	51	21	0	103	36	144	14	2	196	35	103	33	0	171	729
03:30 PM	49	180	20	2	251	23	50	16	0	89	34	150	17	0	201	37	128	27	0	192	733
03:45 PM	51	195	27	2	275	33	50	20	0	103	31	138	20	1	190	41	96	24	0	161	729
<b>Total</b>	<b>199</b>	<b>706</b>	<b>91</b>	<b>11</b>	<b>1007</b>	<b>115</b>	<b>203</b>	<b>80</b>	<b>0</b>	<b>398</b>	<b>153</b>	<b>604</b>	<b>60</b>	<b>4</b>	<b>821</b>	<b>151</b>	<b>400</b>	<b>138</b>	<b>0</b>	<b>689</b>	<b>2915</b>
04:00 PM	45	191	30	6	272	37	45	19	0	101	46	152	22	1	221	27	107	24	0	158	752
04:15 PM	79	258	25	3	365	37	58	13	0	108	39	155	20	2	216	40	112	28	0	180	869
04:30 PM	76	202	30	4	312	39	76	17	0	132	47	180	31	0	258	48	126	24	0	198	900
04:45 PM	63	288	28	5	384	37	83	17	0	137	37	167	24	2	230	31	128	22	0	181	932
<b>Total</b>	<b>263</b>	<b>939</b>	<b>113</b>	<b>18</b>	<b>1333</b>	<b>150</b>	<b>262</b>	<b>66</b>	<b>0</b>	<b>478</b>	<b>169</b>	<b>654</b>	<b>97</b>	<b>5</b>	<b>925</b>	<b>146</b>	<b>473</b>	<b>98</b>	<b>0</b>	<b>717</b>	<b>3453</b>

# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted by: L. Reid

File Name : US 401 @ Ten Ten

Site Code : 00000000

Start Date : 5/1/2013

Page No : 2

Weather: Rain

## Groups Printed- Unshifted - Bank 1 - Bank 2

Start Time	Southbound					Westbound					Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
05:00 PM	69	256	35	1	361	39	73	17	1	130	54	213	41	2	310	29	128	34	0	191	992
05:15 PM	85	333	38	0	456	42	83	21	0	146	66	218	27	4	315	35	126	28	0	189	1106
05:30 PM	78	288	38	0	404	48	64	19	0	131	50	172	33	2	257	44	128	32	0	204	996
05:45 PM	82	342	33	2	459	51	76	24	0	151	43	166	21	1	231	38	113	34	0	185	1026
<b>Total</b>	<b>314</b>	<b>1219</b>	<b>144</b>	<b>3</b>	<b>1680</b>	<b>180</b>	<b>296</b>	<b>81</b>	<b>1</b>	<b>558</b>	<b>213</b>	<b>769</b>	<b>122</b>	<b>9</b>	<b>1113</b>	<b>146</b>	<b>495</b>	<b>128</b>	<b>0</b>	<b>769</b>	<b>4120</b>
06:00 PM	75	278	39	2	394	29	70	21	1	121	29	178	24	3	234	33	115	29	0	177	926
06:15 PM	62	194	35	2	293	39	96	23	0	158	48	170	23	3	244	55	129	26	0	210	905
06:30 PM	67	146	21	2	236	40	80	28	1	149	26	176	23	4	229	48	110	9	0	167	781
06:45 PM	57	136	20	2	215	41	79	20	0	140	30	157	17	1	205	37	108	14	0	159	719
<b>Total</b>	<b>261</b>	<b>754</b>	<b>115</b>	<b>8</b>	<b>1138</b>	<b>149</b>	<b>325</b>	<b>92</b>	<b>2</b>	<b>568</b>	<b>133</b>	<b>681</b>	<b>87</b>	<b>11</b>	<b>912</b>	<b>173</b>	<b>462</b>	<b>78</b>	<b>0</b>	<b>713</b>	<b>3331</b>
07:00 PM	45	121	22	3	191	27	58	27	0	112	31	124	14	4	173	22	82	17	0	121	597
07:15 PM	54	106	11	2	173	23	38	30	0	91	34	111	16	0	161	34	79	10	0	123	548
07:30 PM	45	105	22	2	174	14	40	18	0	72	29	87	8	0	124	30	69	9	0	108	478
07:45 PM	42	108	14	5	169	36	43	8	1	88	15	81	16	0	112	16	41	6	0	63	432
<b>Total</b>	<b>186</b>	<b>440</b>	<b>69</b>	<b>12</b>	<b>707</b>	<b>100</b>	<b>179</b>	<b>83</b>	<b>1</b>	<b>363</b>	<b>109</b>	<b>403</b>	<b>54</b>	<b>4</b>	<b>570</b>	<b>102</b>	<b>271</b>	<b>42</b>	<b>0</b>	<b>415</b>	<b>2055</b>
08:00 PM	21	104	16	5	146	18	29	11	0	58	23	74	13	0	110	22	61	6	0	89	403
08:15 PM	36	104	10	3	153	22	31	7	0	60	19	97	13	1	130	16	81	9	0	106	449
08:30 PM	36	107	14	0	157	22	30	4	0	56	22	81	9	1	113	24	58	6	0	88	414
08:45 PM	40	73	22	3	138	20	29	8	0	57	14	85	11	0	110	17	43	6	0	66	371
<b>Total</b>	<b>133</b>	<b>388</b>	<b>62</b>	<b>11</b>	<b>594</b>	<b>82</b>	<b>119</b>	<b>30</b>	<b>0</b>	<b>231</b>	<b>78</b>	<b>337</b>	<b>46</b>	<b>2</b>	<b>463</b>	<b>79</b>	<b>243</b>	<b>27</b>	<b>0</b>	<b>349</b>	<b>1637</b>
09:00 PM	27	76	10	2	115	11	27	7	0	45	22	76	11	1	110	9	53	9	0	71	341
09:15 PM	50	93	14	6	163	22	17	11	0	50	10	83	5	1	99	11	43	0	0	54	366
09:30 PM	28	69	9	0	106	9	12	11	0	32	9	50	5	0	64	9	42	6	0	57	259
09:45 PM	23	65	11	3	102	8	12	2	0	22	11	39	9	1	60	7	41	3	0	51	235
<b>Total</b>	<b>128</b>	<b>303</b>	<b>44</b>	<b>11</b>	<b>486</b>	<b>50</b>	<b>68</b>	<b>31</b>	<b>0</b>	<b>149</b>	<b>52</b>	<b>248</b>	<b>30</b>	<b>3</b>	<b>333</b>	<b>36</b>	<b>179</b>	<b>18</b>	<b>0</b>	<b>233</b>	<b>1201</b>
<b>Grand Total</b>	<b>2423</b>	<b>8885</b>	<b>1225</b>	<b>199</b>	<b>12732</b>	<b>1769</b>	<b>4069</b>	<b>1500</b>	<b>5</b>	<b>7343</b>	<b>2066</b>	<b>10494</b>	<b>978</b>	<b>100</b>	<b>13638</b>	<b>2188</b>	<b>4283</b>	<b>1450</b>	<b>0</b>	<b>7921</b>	<b>41634</b>
Apprch %	19	69.8	9.6	1.6		24.1	55.4	20.4	0.1		15.1	76.9	7.2	0.7		27.6	54.1	18.3	0		
Total %	5.8	21.3	2.9	0.5	30.6	4.2	9.8	3.6	0	17.6	5	25.2	2.3	0.2	32.8	5.3	10.3	3.5	0	19	
Unshifted	2412	8657	1202	155	12426	1745	4042	1497	4	7288	2032	10267	962	78	13339	2150	4243	1418	0	7811	40864
% Unshifted	99.5	97.4	98.1	77.9	97.6	98.6	99.3	99.8	80	99.3	98.4	97.8	98.4	78	97.8	98.3	99.1	97.8	0	98.6	98.2
% Bank 1	9	227	21	3	260	24	26	3	0	53	33	227	15	3	278	38	38	32	0	108	699
% Bank 1	0.4	2.6	1.7	1.5	2	1.4	0.6	0.2	0	0.7	1.6	2.2	1.5	3	2	1.7	0.9	2.2	0	1.4	1.7
% Bank 2	2	1	2	41	46	0	1	0	1	2	1	0	1	19	21	0	2	0	0	2	71
% Bank 2	0.1	0	0.2	20.6	0.4	0	0	0	20	0	0	0	0.1	19	0.2	0	0	0	0	0	0.2

# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted by: L. Reid

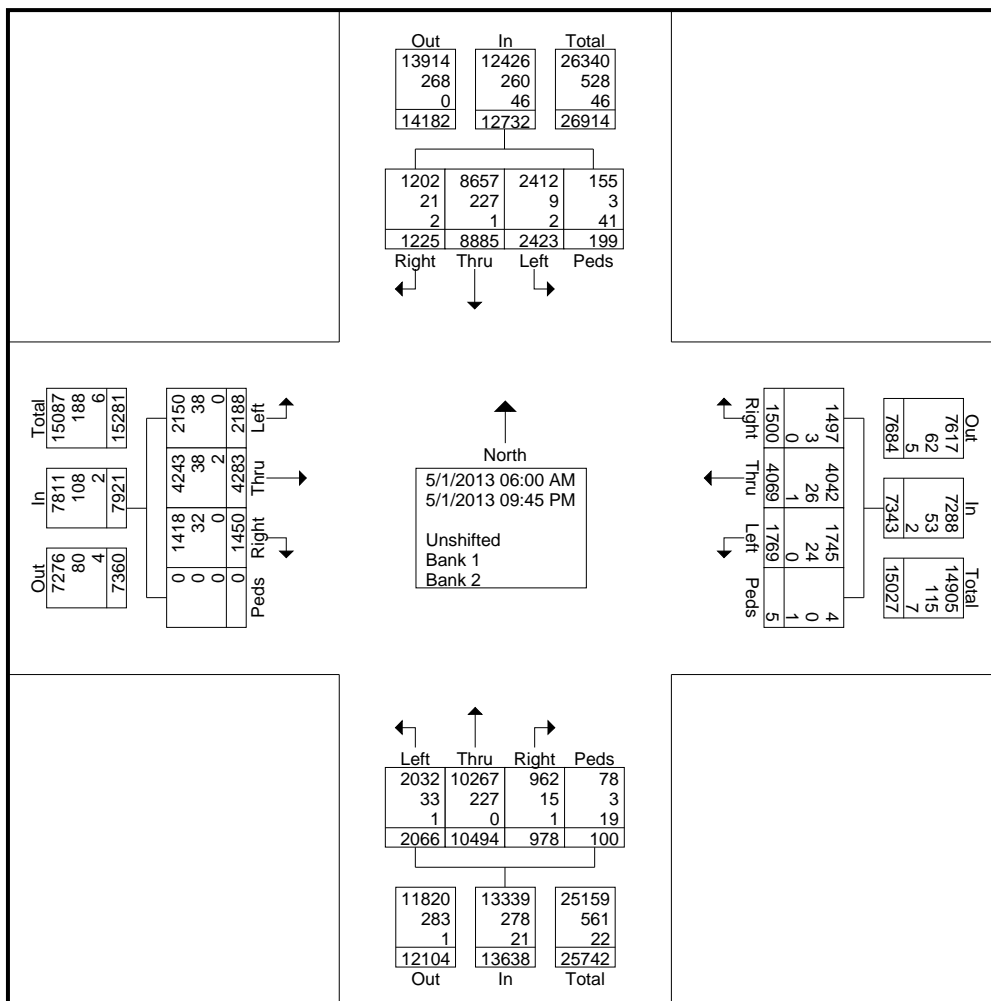
File Name : US 401 @ Ten Ten

Site Code : 00000000

Start Date : 5/1/2013

Page No : 3

Weather: Rain



# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted by: L. Reid

File Name : US 401 @ Ten Ten

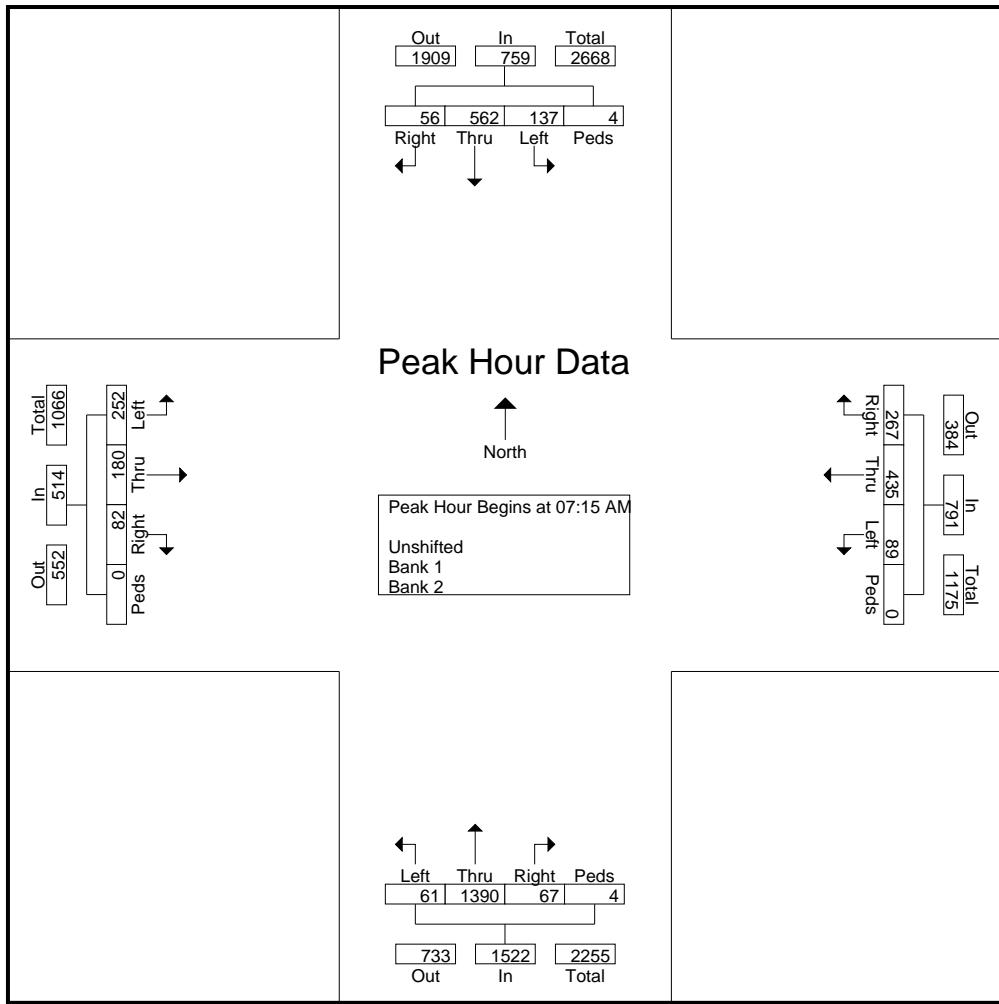
Site Code : 00000000

Start Date : 5/1/2013

Page No : 4

Weather: Rain

Start Time	Southbound					Westbound					Northbound					Eastbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 07:15 AM																						
07:15 AM	32	136	10	0	178	20	126	68	0	214	16	299	11	0	326	57	52	21	0	130	848	
07:30 AM	36	137	12	1	186	20	116	94	0	230	13	351	16	1	381	70	41	21	0	132	929	
07:45 AM	37	181	18	0	236	28	92	62	0	182	15	396	19	1	431	60	44	21	0	125	974	
08:00 AM	32	108	16	3	159	21	101	43	0	165	17	344	21	2	384	65	43	19	0	127	835	
Total Volume	137	562	56	4	759	89	435	267	0	791	61	1390	67	4	1522	252	180	82	0	514	3586	
% App. Total	PHF	.926	.776	.778	.333	.804	.795	.863	.710	.000	.860	.897	.878	.798	.500	.883	.900	.865	.976	.000	.973	.920





# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted by: L. Reid

File Name : US 401 @ Ten Ten

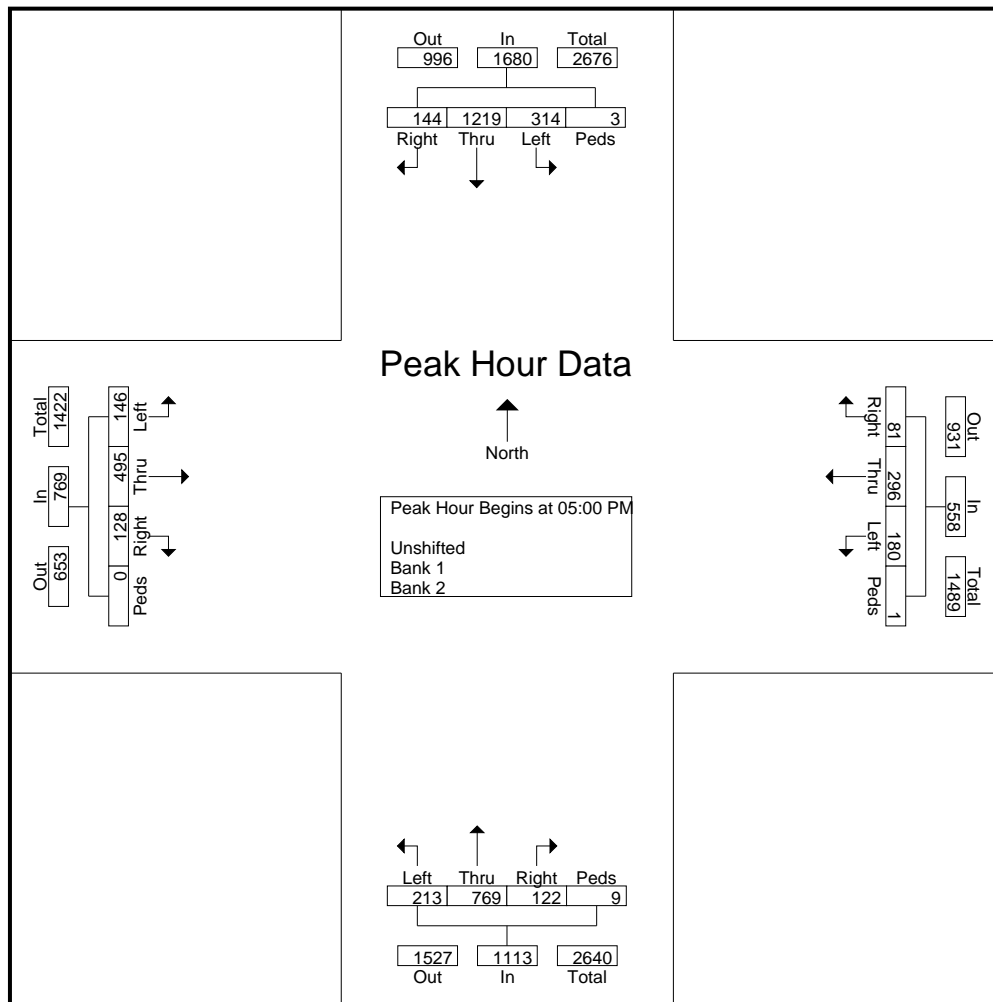
Site Code : 00000000

Start Date : 5/1/2013

Page No : 5

Weather: Rain

Start Time	Southbound					Westbound					Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 12:00 PM to 09:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	69	256	35	1	361	39	73	17	1	130	54	213	41	2	310	29	128	34	0	191	992
05:15 PM	85	333	38	0	456	42	83	21	0	146	66	218	27	4	315	35	126	28	0	189	1106
05:30 PM	78	288	38	0	404	48	64	19	0	131	50	172	33	2	257	44	128	32	0	204	996
05:45 PM	82	342	33	2	459	51	76	24	0	151	43	166	21	1	231	38	113	34	0	185	1026
Total Volume	314	1219	144	3	1680	180	296	81	1	558	213	769	122	9	1113	146	495	128	0	769	4120
% App. Total	18.7	72.6	8.6	0.2		32.3	53	14.5	0.2		19.1	69.1	11	0.8		19	64.4	16.6	0		
PHF	.924	.891	.947	.375	.915	.882	.892	.844	.250	.924	.807	.882	.744	.563	.883	.830	.967	.941	.000	.942	.931



# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted: M. Davenport

File Name : US 401 at Gelder Dr

Site Code : 00134051

Start Date : 5/1/2013

Page No : 1

Weather: Rain

## Groups Printed- Unshifted - Bank 1 - Bank 2

Start Time	US 401 Southbound					Shopping Center Access Westbound					US 401 Northbound					Gelder Drive Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	2	101	2	0	105	0	0	0	0	0	5	420	1	1	427	4	0	4	0	8	540
07:15 AM	6	163	5	1	175	2	1	0	0	3	6	330	1	0	337	5	0	0	0	5	520
07:30 AM	3	168	6	0	177	0	0	0	0	0	1	396	3	0	400	1	0	3	0	4	581
07:45 AM	4	277	3	0	284	0	0	0	0	0	2	365	4	1	372	3	0	1	0	4	660
<b>Total</b>	<b>15</b>	<b>709</b>	<b>16</b>	<b>1</b>	<b>741</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>14</b>	<b>1511</b>	<b>9</b>	<b>2</b>	<b>1536</b>	<b>13</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>21</b>	<b>2301</b>
08:00 AM	2	144	6	1	153	0	0	0	0	0	4	402	3	3	412	8	0	3	0	11	576
08:15 AM	5	165	5	0	175	0	1	0	0	1	2	342	2	3	349	4	1	1	0	6	531
08:30 AM	2	192	4	3	201	0	0	0	0	0	1	295	2	0	298	2	0	2	0	4	503
08:45 AM	1	230	6	6	243	3	0	0	0	3	3	272	3	0	278	8	0	0	0	8	532
<b>Total</b>	<b>10</b>	<b>731</b>	<b>21</b>	<b>10</b>	<b>772</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>10</b>	<b>1311</b>	<b>10</b>	<b>6</b>	<b>1337</b>	<b>22</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>29</b>	<b>2142</b>
*** BREAK ***																					
04:00 PM	7	270	4	2	283	1	2	0	0	3	4	251	0	0	255	9	0	3	0	12	553
04:15 PM	15	342	3	5	365	7	0	0	0	7	3	188	2	0	193	8	1	3	1	13	578
04:30 PM	17	320	4	5	346	8	0	0	0	8	0	256	6	0	262	1	0	1	4	6	622
04:45 PM	13	356	6	2	377	9	0	0	2	11	2	239	3	3	247	2	0	2	0	4	639
<b>Total</b>	<b>52</b>	<b>1288</b>	<b>17</b>	<b>14</b>	<b>1371</b>	<b>25</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>29</b>	<b>9</b>	<b>934</b>	<b>11</b>	<b>3</b>	<b>957</b>	<b>20</b>	<b>1</b>	<b>9</b>	<b>5</b>	<b>35</b>	<b>2392</b>
05:00 PM	10	366	3	9	388	10	0	0	9	19	1	286	3	2	292	10	0	2	0	12	711
05:15 PM	13	395	2	8	418	9	0	0	0	9	4	251	5	1	261	5	0	2	1	8	696
05:30 PM	17	386	7	5	415	13	0	0	1	14	1	228	3	0	232	4	0	2	0	6	667
05:45 PM	18	393	4	4	419	12	2	0	3	17	2	224	3	0	229	8	0	8	0	16	681
<b>Total</b>	<b>58</b>	<b>1540</b>	<b>16</b>	<b>26</b>	<b>1640</b>	<b>44</b>	<b>2</b>	<b>0</b>	<b>13</b>	<b>59</b>	<b>8</b>	<b>989</b>	<b>14</b>	<b>3</b>	<b>1014</b>	<b>27</b>	<b>0</b>	<b>14</b>	<b>1</b>	<b>42</b>	<b>2755</b>
<b>Grand Total</b>	<b>135</b>	<b>4268</b>									<b>4745</b>	<b>44</b>	<b>14</b>	<b>4844</b>	<b>82</b>	<b>2</b>	<b>37</b>	<b>6</b>	<b>127</b>	<b>9590</b>	
<b>Apprch %</b>	3	94.3	1.5	1.1		77.9	6.3	0	15.8		0.8	98	0.9	0.3		64.6	1.6	29.1	4.7		
<b>Total %</b>	1.4	44.5	0.7	0.5	47.2	0.8	0.1	0	0.2	1	0.4	49.5	0.5	0.1	50.5	0.9	0	0.4	0.1	1.3	
<b>Unshifted</b>	135	4225	41	0	4401	74	5	0	15	94	33	4676	43	1	4753	52	2	26	5	85	9333
<b>% Unshifted</b>	100	99	58.6	0	97.3	100	83.3	0	100	98.9	80.5	98.5	97.7	7.1	98.1	63.4	100	70.3	83.3	66.9	97.3
<b>Bank 1</b>	0	43	29	0	72	0	1	0	0	1	6	69	0	0	75	30	0	10	0	40	188
<b>% Bank 1</b>	0	1	41.4	0	1.6	0	16.7	0	0	1.1	14.6	1.5	0	0	1.5	36.6	0	27	0	31.5	2
<b>Bank 2</b>	0	0	0	51	51	0	0	0	0	0	2	0	1	13	16	0	0	1	1	2	69
<b>% Bank 2</b>	0	0	0	100	1.1	0	0	0	0	0	4.9	0	2.3	92.9	0.3	0	0	2.7	16.7	1.6	0.7

# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted: M. Davenport

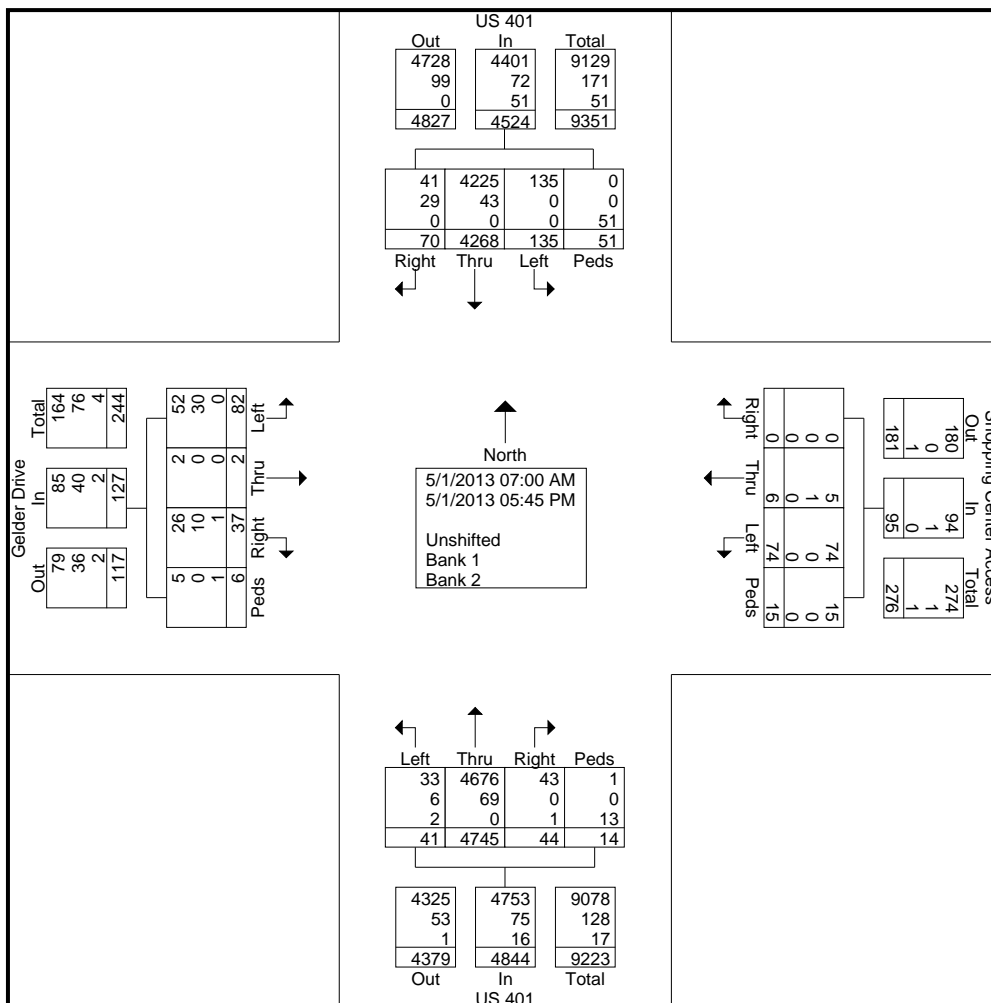
File Name : US 401 at Gelder Dr

Site Code : 00134051

Start Date : 5/1/2013

Page No : 2

Weather: Rain



# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted: M. Davenport

File Name : US 401 at Gelder Dr

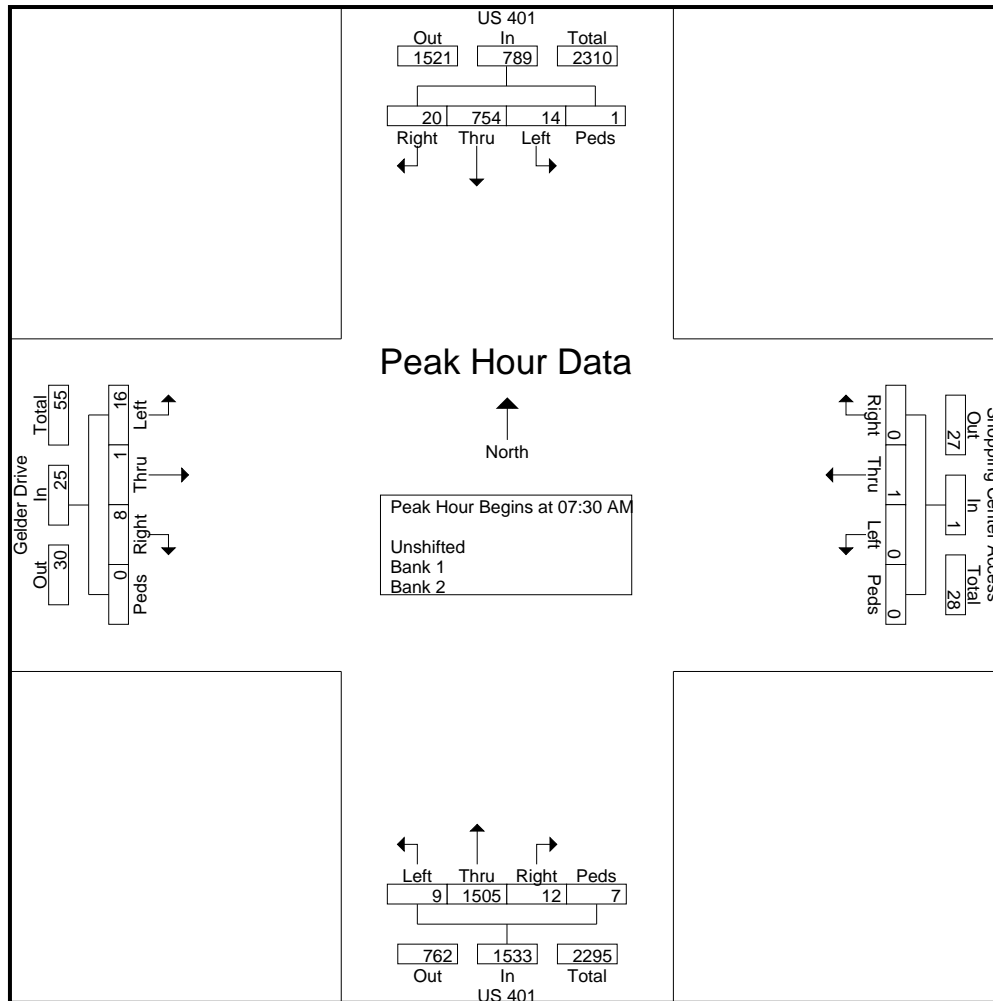
Site Code : 00134051

Start Date : 5/1/2013

Page No : 3

Weather: Rain

Start Time	US 401 Southbound					Shopping Center Access Westbound					US 401 Northbound					Gelder Drive Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	3	168	6	0	177	0	0	0	0	0	1	396	3	0	400	1	0	3	0	4	581
07:45 AM	4	277	3	0	284	0	0	0	0	0	2	365	4	1	372	3	0	1	0	4	660
08:00 AM	2	144	6	1	153	0	0	0	0	0	4	402	3	3	412	8	0	3	0	11	576
08:15 AM	5	165	5	0	175	0	1	0	0	1	2	342	2	3	349	4	1	1	0	6	531
Total Volume	14	754	20	1	789	0	1	0	0	1	9	1505	12	7	1533	16	1	8	0	25	2348
% App. Total	PHF	.700	.681	.833	.250	.695	.000	.250	.000	.250	.563	.936	.750	.583	.930	.500	.250	.667	.000	.568	.889



# Davenport Transportation Consulting

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Phone: 336-744-1636

Counted: M. Davenport

File Name : US 401 at Gelder Dr

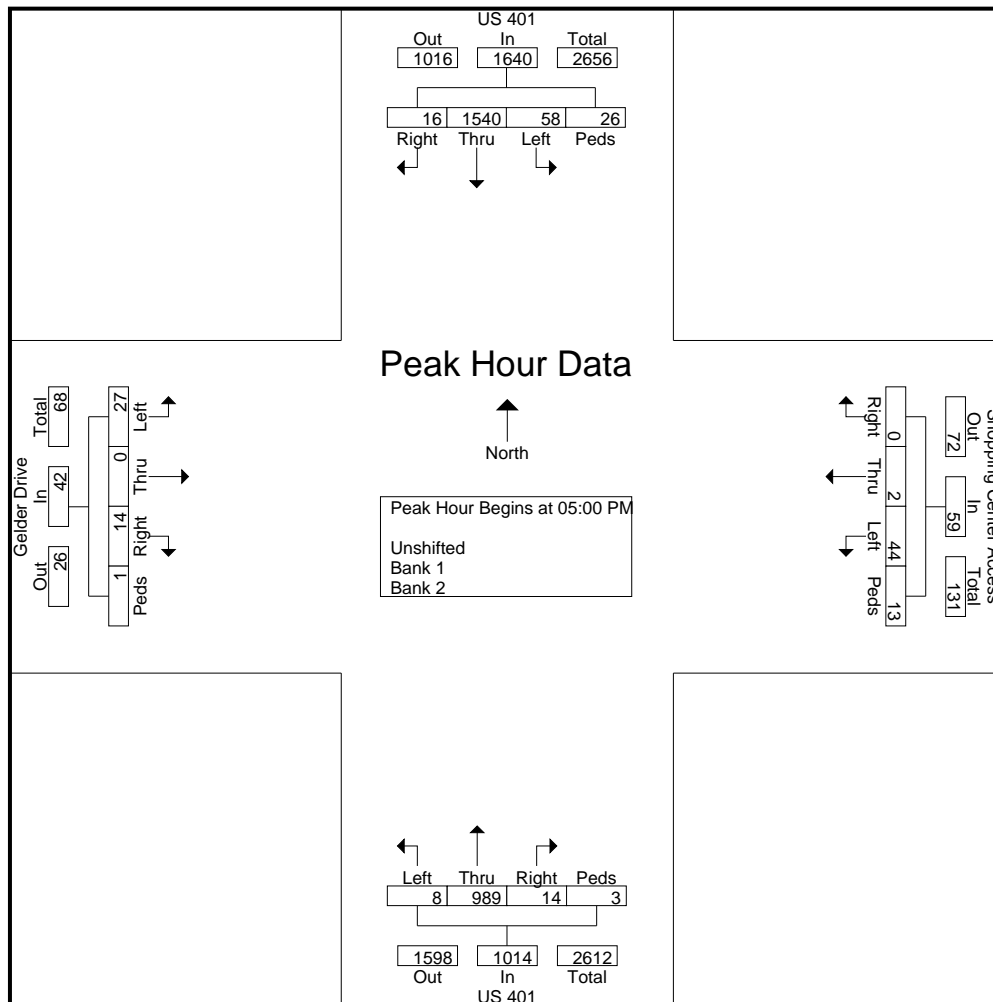
Site Code : 00134051

Start Date : 5/1/2013

Page No : 4

Weather: Rain

Start Time	US 401 Southbound					Shopping Center Access Westbound					US 401 Northbound					Gelder Drive Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	10	366	3	9	388	10	0	0	9	19	1	286	3	2	292	10	0	2	0	12	711
05:15 PM	13	395	2	8	418	9	0	0	0	9	4	251	5	1	261	5	0	2	1	8	696
05:30 PM	17	386	7	5	415	13	0	0	1	14	1	228	3	0	232	4	0	2	0	6	667
05:45 PM	18	393	4	4	419	12	2	0	3	17	2	224	3	0	229	8	0	8	0	16	681
Total Volume	58	1540	16	26	1640	44	2	0	13	59	8	989	14	3	1014	27	0	14	1	42	2755
% App. Total	3.5	93.9	1	1.6		74.6	3.4	0	22		0.8	97.5	1.4	0.3		64.3	0	33.3	2.4		
PHF	.806	.975	.571	.722	.979	.846	.250	.000	.361	.776	.500	.865	.700	.375	.868	.675	.000	.438	.250	.656	.969





# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted By: M. Davenport

File Name : US 401 @ Smithfield Barbecue Advance Auto Entrance

Site Code : 00134053

Start Date : 5/1/2013

Weather: Rain

Page No : 2

## Groups Printed- Cars - Trucks and Buses - Bikes and Uturns

Start Time	US 401 Southbound					Smithfield Barbecue and Advance Entrance Westbound					US 401 Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	9	313	0	0	322	6	0	3	0	9	0	206	1	16	223	0	0	0	0	0	554
04:15 PM	12	414	0	0	426	13	0	7	0	20	0	170	6	11	187	0	0	0	0	0	633
04:30 PM	19	389	0	1	409	5	0	8	0	13	0	202	3	9	214	0	0	0	0	0	636
04:45 PM	22	451	0	0	473	6	0	6	0	12	0	191	0	8	199	0	0	0	0	0	684
Total	62	1567	0	1	1630	30	0	24	0	54	0	769	10	44	823	0	0	0	0	0	2507
05:00 PM	15	419	0	0	434	5	0	8	0	13	0	204	6	7	217	0	0	0	0	0	664
05:15 PM	15	445	0	0	460	1	0	4	1	6	0	180	3	6	189	0	0	0	0	0	655
05:30 PM	10	443	0	0	453	4	0	4	0	8	0	181	2	12	195	0	0	0	0	0	656
05:45 PM	15	415	0	0	430	6	0	6	0	12	0	181	3	6	190	0	0	0	0	0	632
Total	55	1722	0	0	1777	16	0	22	1	39	0	746	14	31	791	0	0	0	0	0	2607
Grand Total	191	4779	0	1	4971	61	0	84	3	148	0	4738	33	174	4945	0	0	0	1	1	10065
Apprch %	3.8	96.1	0	0		41.2	0	56.8	2		0	95.8	0.7	3.5		0	0	0	100		
Total %	1.9	47.5	0	0	49.4	0.6	0	0.8	0	1.5	0	47.1	0.3	1.7	49.1	0	0	0	0	0	
Cars	190	4667	0	0	4857	61	0	82	3	146	0	4645	31	3	4679	0	0	0	1	1	9683
% Cars	99.5	97.7	0	0	97.7	100	0	97.6	100	98.6	0	98	93.9	1.7	94.6	0	0	0	100	100	96.2
Trucks and Buses																					
% Trucks and Buses	0.5	2.3	0	0	2.3	0	0	2.4	0	1.4	0	1.9	6.1	0.6	1.9	0	0	0	0	0	2.1
Bikes and Uturns	0	0	0	1	1	0	0	0	0	0	0	1	0	170	171	0	0	0	0	0	172
% Bikes and Uturns	0	0	0	100	0	0	0	0	0	0	0	0	0	97.7	3.5	0	0	0	0	0	1.7

# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted By: M. Davenport

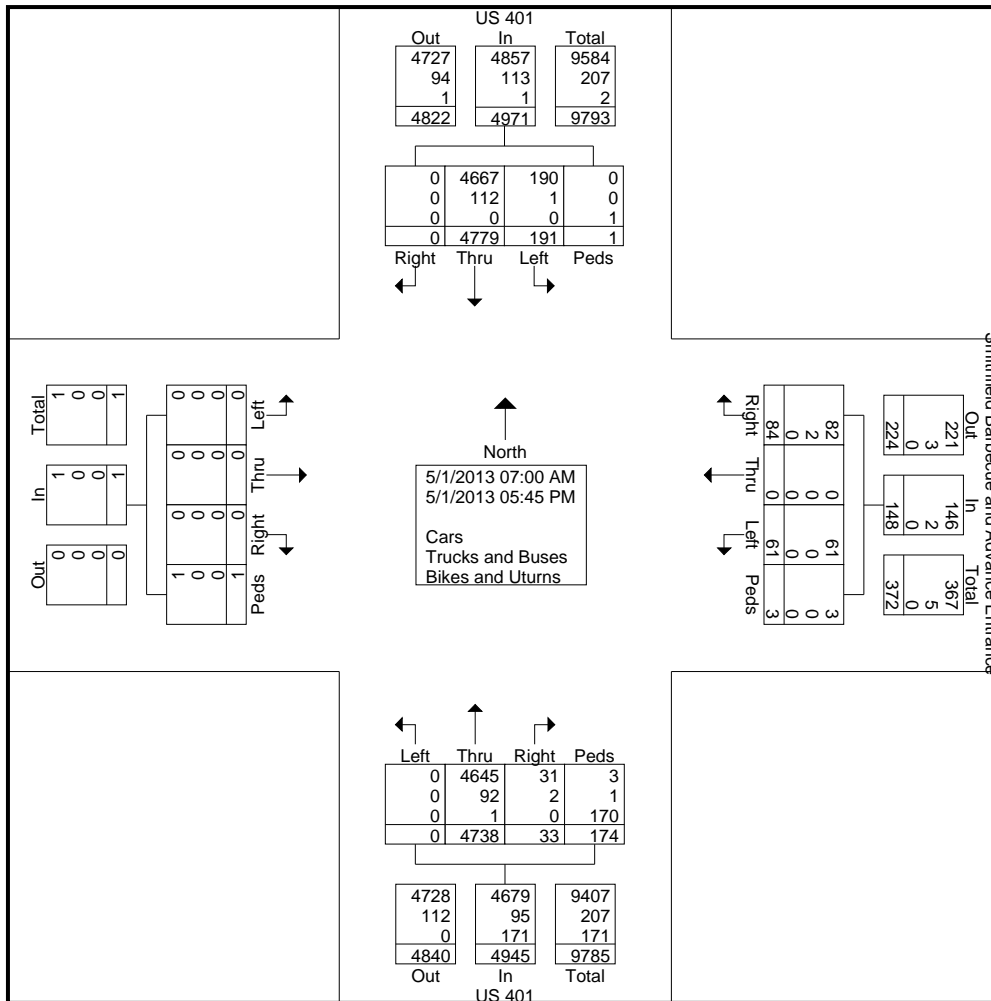
File Name : US 401 @ Smithfield Barbecue Advance Auto Entrance

Site Code : 00134053

Start Date : 5/1/2013

Weather: Rain

Page No : 3





# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted By: M. Davenport

File Name : US 401 @ Smithfield Barbecue Advance Auto Entrance

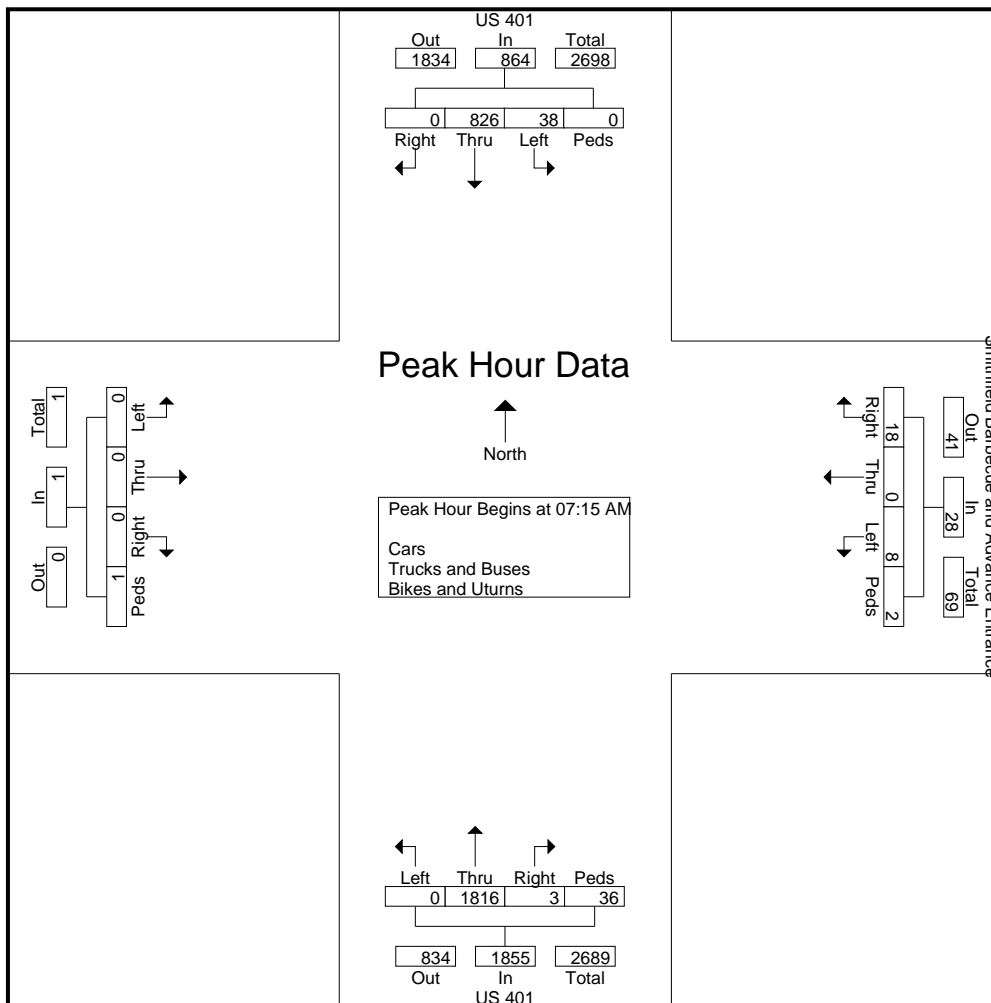
Site Code : 00134053

Start Date : 5/1/2013

Weather: Rain

Page No : 4

Start Time	US 401 Southbound					Smithfield Barbecue and Advance Entrance Westbound					US 401 Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	11	177	0	0	188	0	0	2	0	2	0	434	0	9	443	0	0	0	0	0	633
07:30 AM	10	218	0	0	228	1	0	3	1	5	0	473	1	6	480	0	0	0	0	0	713
07:45 AM	13	254	0	0	267	4	0	5	0	9	0	486	1	6	493	0	0	0	0	0	769
08:00 AM	4	177	0	0	181	3	0	8	1	12	0	423	1	15	439	0	0	0	1	1	633
Total Volume	38	826	0	0	864	8	0	18	2	28	0	1816	3	36	1855	0	0	0	1	1	2748
% App. Total	4.4	95.6	0	0		28.6	0	64.3	7.1		0	97.9	0.2	1.9		0	0	0	100		
PHF	.731	.813	.000	.000	.809	.500	.000	.563	.500	.583	.000	.934	.750	.600	.941	.000	.000	.000	.250	.250	.893



# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted By: M. Davenport

File Name : US 401 @ Smithfield Barbecue Advance Auto Entrance

Site Code : 00134053

Start Date : 5/1/2013

Weather: Rain

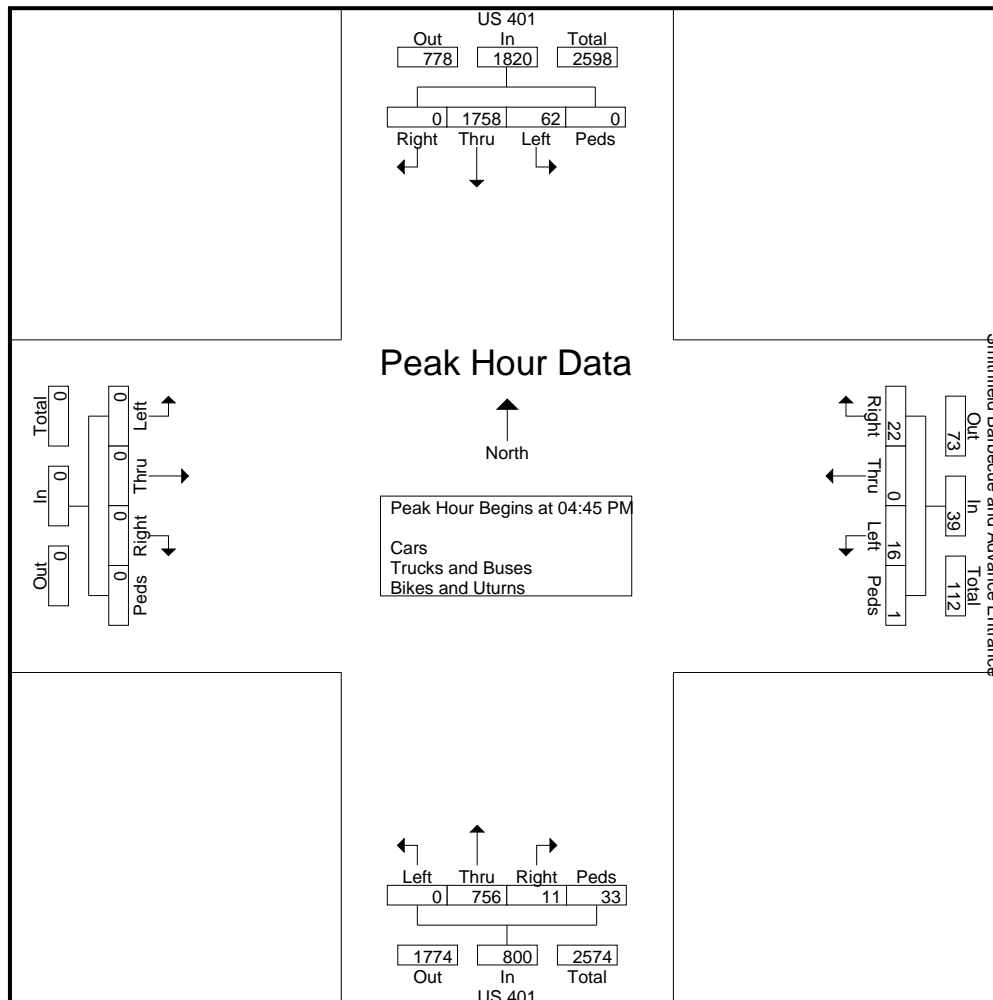
Page No : 5

Start Time	US 401 Southbound					Smithfield Barbecue and Advance Entrance Westbound					US 401 Northbound					Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:45 PM

04:45 PM	22	451	0	0	473	6	0	6	0	12	0	191	0	8	199	0	0	0	0	0	684
05:00 PM	15	419	0	0	434	5	0	8	0	13	0	204	6	7	217	0	0	0	0	0	664
05:15 PM	15	445	0	0	460	1	0	4	1	6	0	180	3	6	189	0	0	0	0	0	655
05:30 PM	10	443	0	0	453	4	0	4	0	8	0	181	2	12	195	0	0	0	0	0	656
Total Volume	62	1758	0	0	1820	16	0	22	1	39	0	756	11	33	800	0	0	0	0	0	2659
% App. Total	3.4	96.6	0	0		41	0	56.4	2.6		0	94.5	1.4	4.1		0	0	0	0		
PHF	.705	.975	.000	.000	.962	.667	.000	.688	.250	.750	.000	.926	.458	.688	.922	.000	.000	.000	.000	.000	.972



# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted By: M. Davenport

File Name : Ten Ten @ Harris Teeter

Site Code : 00134055

Start Date : 5/1/2013

Page No : 1

Weather: Rain

## Groups Printed- Cars - Trucks and Buses - Bikes and Uturns

Start Time	Southbound					Ten Ten Road Westbound					Harris Teeter Full Access Drive Northbound					Ten Ten Road Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	0	0	0	0	0	7	234	0	0	241	3	0	2	0	5	0	53	4	0	57	303
07:15 AM	0	0	0	0	0	9	236	0	0	245	3	0	6	0	9	0	91	0	0	91	345
07:30 AM	0	0	0	0	0	12	237	0	0	249	11	0	3	0	14	0	96	7	0	103	366
07:45 AM	0	0	0	0	0	12	212	0	0	224	5	0	2	0	7	0	96	0	1	97	328
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>919</b>	<b>0</b>	<b>0</b>	<b>959</b>	<b>22</b>	<b>0</b>	<b>13</b>	<b>0</b>	<b>35</b>	<b>0</b>	<b>336</b>	<b>11</b>	<b>1</b>	<b>348</b>	<b>1342</b>
08:00 AM	0	0	0	0	0	9	161	0	0	170	7	0	5	0	12	0	93	3	3	99	281
08:15 AM	0	0	0	0	0	3	164	0	0	167	4	0	1	0	5	0	95	1	1	97	269
08:30 AM	0	0	0	0	0	8	157	0	0	165	5	0	3	0	8	0	54	2	0	56	229
08:45 AM	0	0	0	0	0	7	139	0	0	146	4	0	0	0	4	0	86	1	1	88	238
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>27</b>	<b>621</b>	<b>0</b>	<b>0</b>	<b>648</b>	<b>20</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>29</b>	<b>0</b>	<b>328</b>	<b>7</b>	<b>5</b>	<b>340</b>	<b>1017</b>
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
04:00 PM	0	0	0	0	0	19	100	0	0	119	13	0	10	0	23	0	144	0	0	144	286
04:15 PM	0	0	0	1	1	14	88	0	0	102	11	0	23	0	34	0	176	3	2	181	318
04:30 PM	0	0	0	0	0	7	95	0	0	102	6	0	19	0	25	0	196	2	1	199	326

# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted By: M. Davenport

File Name : Ten Ten @ Harris Teeter

Site Code : 00134055

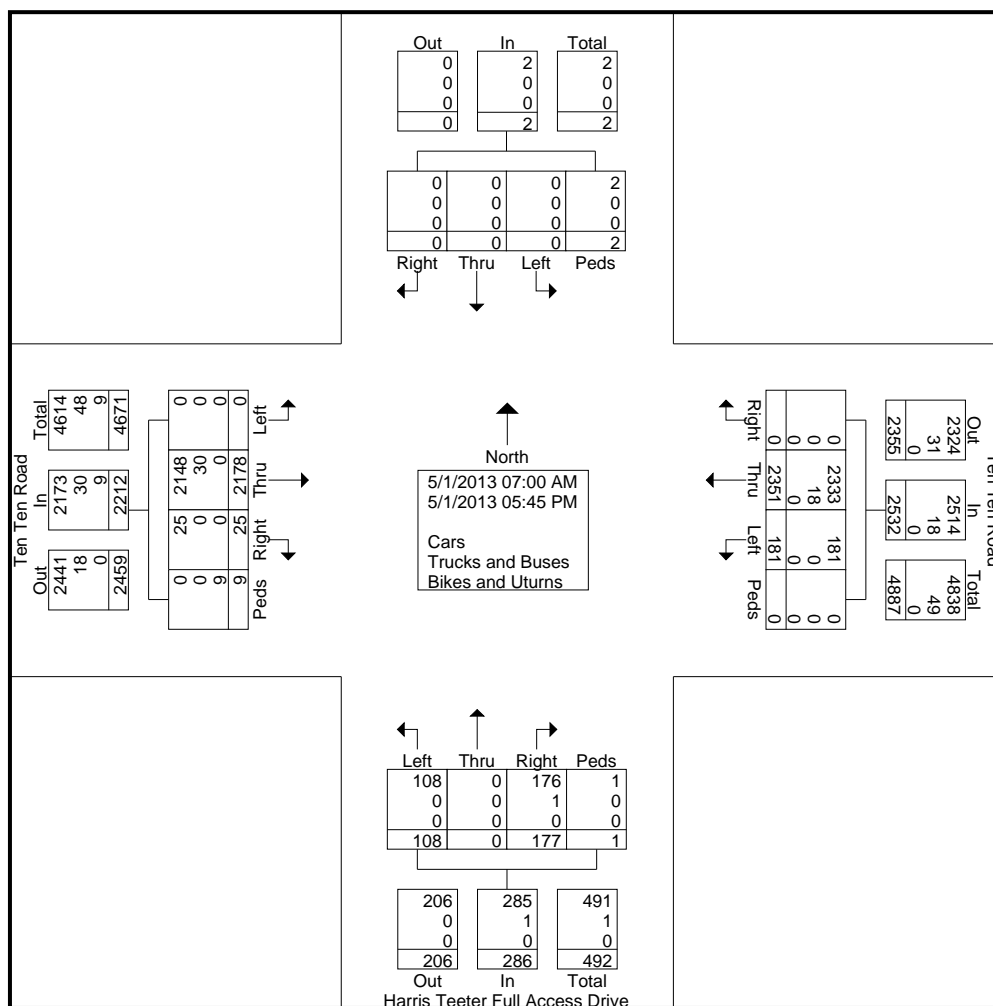
Start Date : 5/1/2013

Page No : 2

Weather: Rain

## Groups Printed- Cars - Trucks and Buses - Bikes and Uturns

Start Time	Southbound					Ten Ten Road Westbound					Harris Teeter Full Access Drive Northbound					Ten Ten Road Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:45 PM	0	0	0	0	0	18	104	0	0	122	9	0	16	0	25	0	190	0	0	190	337
Total	0	0	0	1	1	58	387	0	0	445	39	0	68	0	107	0	706	5	3	714	1267
05:00 PM	0	0	0	0	0	14	100	0	0	114	5	0	17	0	22	0	202	1	0	203	339
05:15 PM	0	0	0	0	0	16	120	0	0	136	6	0	18	0	24	0	220	0	0	220	380
05:30 PM	0	0	0	0	0	17	98	0	0	115	8	0	20	0	28	0	200	0	0	200	343
05:45 PM	0	0	0	1	1	9	106	0	0	115	8	0	32	1	41	0	186	1	0	187	344
Total	0	0	0	1	1	56	424	0	0	480	27	0	87	1	115	0	808	2	0	810	1406
Grand Total	0	0	0	2	2	181	2351	0	0	2532	108	0	177	1	286	0	2178	25	9	2212	5032
Apprch %	0	0	0	100		7.1	92.9	0	0		37.8	0	61.9	0.3		0	98.5	1.1	0.4		
Total %	0	0	0	0	0	3.6	46.7	0	0	50.3	2.1	0	3.5	0	5.7	0	43.3	0.5	0.2	44	
Cars	0	0	0	2	2	181	2333	0	0	2514	108	0	176	1	285	0	2148	25	0	2173	4974
% Cars	0	0	0	100	100	100	99.2	0	0	99.3	100	0	99.4	100	99.7	0	98.6	100	0	98.2	98.8
Trucks and Buses	0	0	0	0	0	0	18	0	0	18	0	0	1	0	1	0	30	0	0	30	49
% Trucks and Buses	0	0	0	0	0	0	0.8	0	0	0.7	0	0	0.6	0	0.3	0	1.4	0	0	1.4	1
Bikes and Uturns	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9	9
% Bikes and Uturns	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0.4	0.2



# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted By: M. Davenport

File Name : Ten Ten @ Harris Teeter

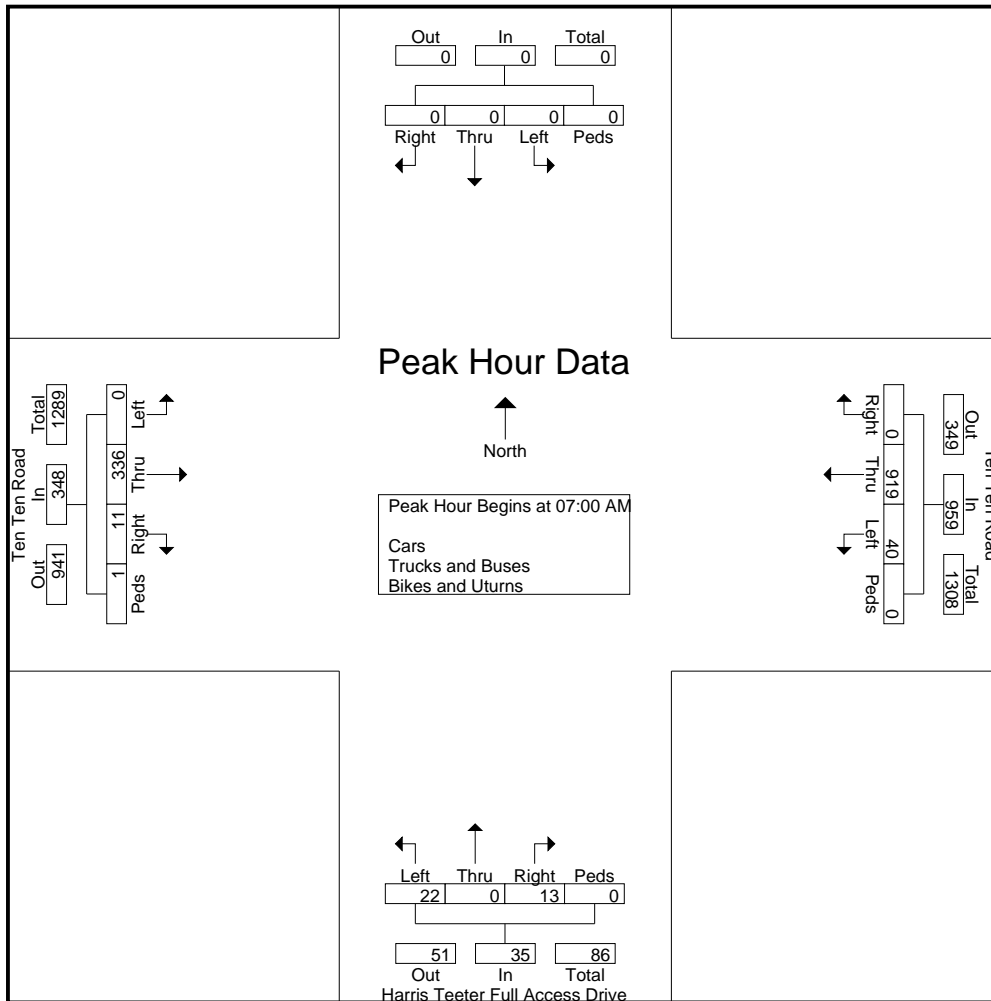
Site Code : 00134055

Start Date : 5/1/2013

Page No : 3

Weather: Rain

Start Time	Southbound					Ten Ten Road Westbound					Harris Teeter Full Access Drive Northbound					Ten Ten Road Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	7	234	0	0	241	3	0	2	0	5	0	53	4	0	57	303
07:15 AM	0	0	0	0	0	9	236	0	0	245	3	0	6	0	9	0	91	0	0	91	345
07:30 AM	0	0	0	0	0	12	237	0	0	249	11	0	3	0	14	0	96	7	0	103	366
07:45 AM	0	0	0	0	0	12	212	0	0	224	5	0	2	0	7	0	96	0	1	97	328
Total Volume	0	0	0	0	0	40	919	0	0	959	22	0	13	0	35	0	336	11	1	348	1342
% App. Total	0	0	0	0	0	4.2	95.8	0	0		62.9	0	37.1	0		0	96.6	3.2	0.3		
PHF	.000	.000	.000	.000	.000	.833	.969	.000	.000	.963	.500	.000	.542	.000	.625	.000	.875	.393	.250	.845	.917



# Davenport Transportation Consulting

305 W. 4th Street, Suite 2A

Winston-Salem, NC 27101

Phone: 336-744-1636

Counted By: M. Davenport

File Name : Ten Ten @ Harris Teeter

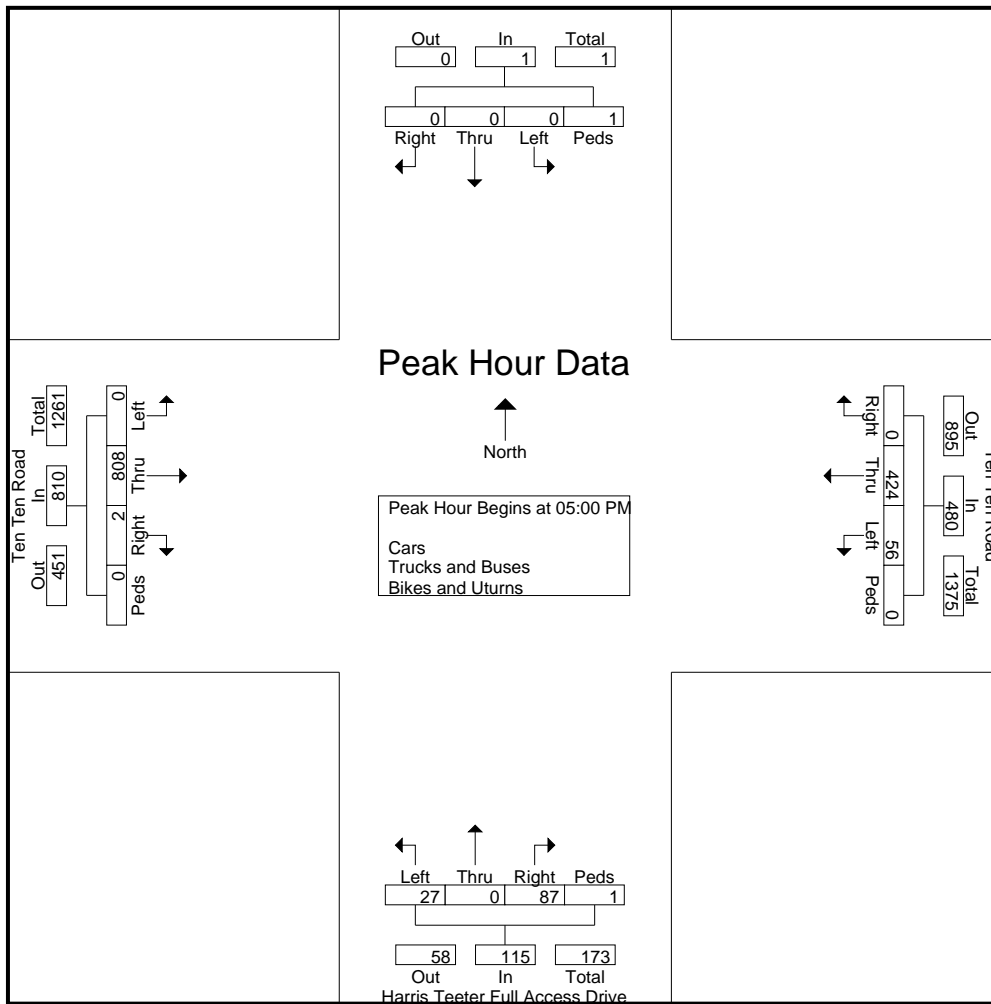
Site Code : 00134055

Start Date : 5/1/2013

Page No : 4

Weather: Rain

Start Time	Southbound					Ten Ten Road Westbound					Harris Teeter Full Access Drive Northbound					Ten Ten Road Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	0	0	0	0	14	100	0	0	114	5	0	17	0	22	0	202	1	0	203	339
05:15 PM	0	0	0	0	0	16	120	0	0	136	6	0	18	0	24	0	220	0	0	220	380
05:30 PM	0	0	0	0	0	17	98	0	0	115	8	0	20	0	28	0	200	0	0	200	343
05:45 PM	0	0	0	1	1	9	106	0	0	115	8	0	32	1	41	0	186	1	0	187	344
Total Volume	0	0	0	1	1	56	424	0	0	480	27	0	87	1	115	0	808	2	0	810	1406
% App. Total	0	0	0	100		11.7	88.3	0	0		23.5	0	75.7	0.9		0	99.8	0.2	0		
PHF	.000	.000	.000	.250	.250	.824	.883	.000	.000	.882	.844	.000	.680	.250	.701	.000	.918	.500	.000	.920	.925



## Appendix D: Signal Timing







# Appendix E: Cost Estimates



PROJECT: 13-405 CAMPO Feasibility and Impact Studies  
 RE: Opinion of Probable Cost of Roadway Improvements (Quantities approximated from recommended improvements)  
 LOCATION: TEN TEN ALTERNATE 1 (MICHIGAN LEFTS)  
 YEAR: 2020  
 DATE: 05/29/13  
 ESTIMATE (2013): \$2,450,000  
 ESTIMATE (2020): **\$3,000,000**

Davenport Transportation Consulting has no control over the cost of labor, materials, equipment, or services furnished by others, or over methods of determining price, or over competitive bidding or market conditions. Any and all professional opinions as to costs reflected herein, including but not limited to professional opinions as to the costs of construction materials, are made on the basis of professional experience and available data. Davenport Transportation Consulting cannot and does not guarantee or warrant that proposals, bids, or actual costs will not vary from the professional opinions of costs shown herein.

Item No.	Item Description	Quantity	Unit	Unit Price	Amount
1	Mobilization	1	LS	\$108,440	\$108,440
2	Asphalt	9,800	TN	\$50.00	\$490,000
3	Asphalt Binder	130	TN	\$630.00	\$81,900
4	Concrete	5,500	SY	\$25.00	\$137,500
5	Pavement Marking Lines and Symbols	1	LS	\$25,000	\$25,000
6	Signals	1	LS	\$350,000	\$350,000
7	Signing	1	LS	\$21,688	\$21,688
8	Drainage	1	LS	\$162,660	\$162,660
9	Lighting	1	LS	\$54,220	\$54,220
10	Utilities	1	LS	\$108,440	\$108,440
11	Grading	1	LS	\$325,320	\$325,320
12	Erosion Control	1	LS	\$54,220	\$54,220
13	Traffic Control	1	LS	\$162,660	\$162,660
14	Seeding & Mulching	1	LS	\$54,220	\$54,220

**NOTES:**

- 10% Mobilization
- 2% Signing
- 15% Drainage
- 5% Lighting
- 10% Utilities
- 30% Grading
- 5% Erosion Control
- 15% Traffic Control
- 5% Seeding & Mulching

	Subtotal	<u>\$2,136,268</u>
15%	Contingency	<u>\$320,440</u>
	Subtotal	<u>\$2,456,708</u>
	<b>SAY</b>	<u><b>\$2,450,000</b></u>

- Used ~3% inflation to project 2020 construction costs
- Unit prices based upon approximate NCDOT Bid Averages



PROJECT: 13-405 CAMPO Feasibility and Impact Studies  
 RE: Opinion of Probable Cost of Roadway Improvements (Quantities approximated from recommended improvements)  
 LOCATION: TEN TEN ALTERNATE 2 (MICHIGAN LEFTS + SINGLE QUADRANT)  
 YEAR: 2020 and 2040  
 DATE: 05/29/13  
 ESTIMATE (2013): \$865,000  
 ESTIMATE (2020): **\$1,060,000**

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Item No.	Item Description	Quantity	Unit	Unit Price	Amount
1	Mobilization	1	LS	\$40,335	\$40,335
2	Asphalt	3,250	TN	\$50.00	\$162,500
3	Asphalt Binder	45	TN	\$630.00	\$28,350
4	Concrete	1,000	SY	\$25.00	\$25,000
5	Pavement Marking Lines and Symbols	1	LS	\$7,500	\$7,500
6	Signals	1	LS	\$180,000	\$180,000
7	Signing	1	LS	\$8,067	\$8,067
8	Drainage	1	LS	\$60,503	\$60,503
9	Lighting	1	LS	\$8,067	\$8,067
10	Utilities	1	LS	\$40,335	\$40,335
11	Grading	1	LS	\$121,005	\$121,005
12	Erosion Control	1	LS	\$20,168	\$20,168
13	Traffic Control	1	LS	\$40,335	\$40,335
14	Seeding & Mulching	1	LS	\$8,067	\$8,067

**NOTES:**

- 10% Mobilization
- 2% Signing
- 15% Drainage
- 2% Lighting
- 10% Utilities
- 30% Grading
- 5% Erosion Control
- 10% Traffic Control
- 2% Seeding & Mulching

	Subtotal	<u>\$750,231</u>
15%	Contingency	<u>\$112,535</u>
	Subtotal	<u>\$862,766</u>
	<b>SAY</b>	<u><b>\$865,000</b></u>

- Loop Road assumed to be constructed by developer
- Used ~3% inflation to project 2020 construction costs
- Unit prices based upon approximate NCDOT Bid Averages



PROJECT: 13-405 CAMPO Feasibility and Impact Studies  
 RE: Opinion of Probable Cost of Roundabout (Quantities approximated from recommended improvements)  
 LOCATION: TEN TEN ALTERNATE 2 (MICHIGAN LEFTS + SINGLE QUADRANT)  
 YEAR: 2020 and 2040  
 DATE: 05/29/13  
 ESTIMATE (2013): \$975,000  
 ESTIMATE (2040): \$2,165,000

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Item No.	Item Description	Quantity	Unit	Unit Price	Amount
1	Mobilization	1	LS	\$44,965	\$44,965
2	Asphalt	4,000	TN	\$50.00	\$200,000
3	Asphalt Binder	55	TN	\$630.00	\$34,650
4	Concrete	1,000	SY	\$25.00	\$25,000
5	Pavement Marking Lines and Symbols	1	LS	\$10,000	\$10,000
6	Signals	1	LS	\$180,000	\$180,000
7	Signing	1	LS	\$8,993	\$8,993
8	Drainage	1	LS	\$67,448	\$67,448
9	Lighting	1	LS	\$8,993	\$8,993
10	Utilities	1	LS	\$44,965	\$44,965
11	Grading	1	LS	\$134,895	\$134,895
12	Erosion Control	1	LS	\$22,483	\$22,483
13	Traffic Control	1	LS	\$44,965	\$44,965
14	Seeding & Mulching	1	LS	\$8,993	\$8,993

NOTES:

			Subtotal	\$836,349	
-	10%	Mobilization	15%	Contingency	\$125,452
-	2%	Signing		Subtotal	\$961,801
-	15%	Drainage		<b>SAY</b>	<b>\$975,000</b>
-	2%	Lighting			
-	10%	Utilities			
-	30%	Grading			
-	5%	Erosion Control			
-	10%	Traffic Control			
-	2%	Seeding & Mulching			
-		Loop Road assumed to be constructed by developer			
-		Used -3% inflation to project 2020 construction costs			
-		Unit prices based upon approximate NCDOT Bid Averages			



PROJECT: 13-405 CAMPO Feasibility and Impact Studies  
 RE: Opinion of Probable Cost of Roadway Improvements (Quantities approximated from recommended improvements)  
 LOCATION: HILLTOP ALTERNATE 1 (SUPERSTREET)  
 YEAR: 2020  
 DATE: 05/29/13  
 ESTIMATE (2013): \$1,600,000  
 ESTIMATE (2020): **\$2,000,000**

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Item No.	Item Description	Quantity	Unit	Unit Price	Amount
1	Mobilization	1	LS	\$68,410	\$68,410
2	Asphalt	5,000	TN	\$50.00	\$250,000
3	Asphalt Binder	70	TN	\$630.00	\$44,100
4	Concrete	3,000	SY	\$25.00	\$75,000
5	Pavement Marking Lines and Symbols	1	LS	\$15,000	\$15,000
6	Signals	1	LS	\$300,000	\$300,000
7	Signing	1	LS	\$34,205	\$34,205
8	Drainage	1	LS	\$102,615	\$102,615
9	Lighting	1	LS	\$34,205	\$34,205
10	Utilities	1	LS	\$68,410	\$68,410
11	Grading	1	LS	\$205,230	\$205,230
12	Erosion Control	1	LS	\$34,205	\$34,205
13	Traffic Control	1	LS	\$102,615	\$102,615
14	Seeding & Mulching	1	LS	\$34,205	\$34,205

**NOTES:**

- 10% Mobilization
- 5% Signing
- 15% Drainage
- 5% Lighting
- 10% Utilities
- 30% Grading
- 5% Erosion Control
- 15% Traffic Control
- 5% Seeding & Mulching

Subtotal	\$1,368,200
15% Contingency	\$205,230
Subtotal	\$1,573,430
<b>SAY</b>	<b>\$1,600,000</b>

- Used ~3% inflation to project 2020 construction costs
- Unit prices based upon approximate NCDOT Bid Averages



PROJECT: 13-405 CAMPO Feasibility and Impact Studies  
 RE: Opinion of Probable Cost of Roadway Improvements (Quantities approximated from recommended improvements)  
 LOCATION: HILLTOP ALTERNATE 2 (REVERSE SUPERSTREET)  
 YEAR: 2020  
 DATE: 05/29/13  
 ESTIMATE (2013): \$1,500,000  
 ESTIMATE (2020): **\$1,850,000**

Davenport Transportation Consulting has no control over the cost of labor, materials, equipment, or services furnished by others, or over methods of determining price, or over competitive bidding or market conditions. Any and all professional opinions as to costs reflected herein, including but not limited to professional opinions as to the costs of construction materials, are made on the basis of professional experience and available data. Davenport Transportation Consulting cannot and does not guarantee or warrant that proposals, bids, or actual costs will not vary from the professional opinions of costs shown herein.

Item No.	Item Description	Quantity	Unit	Unit Price	Amount
1	Mobilization	1	LS	\$64,780	\$64,780
2	Asphalt	4,500	TN	\$50.00	\$225,000
3	Asphalt Binder	60	TN	\$630.00	\$37,800
4	Concrete	2,800	SY	\$25.00	\$70,000
5	Pavement Marking Lines and Symbols	1	LS	\$15,000	\$15,000
6	Signals	1	LS	\$300,000	\$300,000
7	Signing	1	LS	\$32,390	\$32,390
8	Drainage	1	LS	\$97,170	\$97,170
9	Lighting	1	LS	\$32,390	\$32,390
10	Utilities	1	LS	\$64,780	\$64,780
11	Grading	1	LS	\$194,340	\$194,340
12	Erosion Control	1	LS	\$32,390	\$32,390
13	Traffic Control	1	LS	\$97,170	\$97,170
14	Seeding & Mulching	1	LS	\$32,390	\$32,390

**NOTES:**

- 10% Mobilization
- 5% Signing
- 15% Drainage
- 5% Lighting
- 10% Utilities
- 30% Grading
- 5% Erosion Control
- 15% Traffic Control
- 5% Seeding & Mulching

	Subtotal	<u>\$1,295,600</u>
15%	Contingency	<u>\$194,340</u>
	Subtotal	<u>\$1,489,940</u>
	<b>SAY</b>	<u><b>\$1,500,000</b></u>

- Used ~3% inflation to project 2020 construction costs
- Unit prices based upon approximate NCDOT Bid Averages