Comment 1-58:

Level of Service Analysis
- NYSDOT Letter
- Detailed Level of Service Reports at Key Intersections

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
REGION ONE
ALBANY, NY 12232
www.dot.ny.gov

SAM ZHOU, P.E.
ACTING REGIONAL DIRECTOR

JOAN MCDONALD
COMMISSIONER

March 28, 2013

Mr. Mike Hartman, PE
The Chazen Companies
547 River Street
Troy, NY 12180

Re: Highway Capacity Software
Global Foundries – Fab 8.2 TIS
Town of Malta
Saratoga County

Dear Mr. Hartman:

I am writing in response to your March 27, 2013 letter regarding the appropriate version of the Highway Capacity Manual (HCM) to use in order to complete the capacity/level of service analysis associated with the proposed Global Foundries Fab 8.2 project.

The NYSDOT Highway Design Manual states that capacity analysis are to be consistent with the most recent version of the HCM and EB 01-018 initially implemented the 2000 Highway Capacity Manual to be used for all new capacity analysis performed after July 1, 2001. The most recent EB on this topic is 07-012 which continues the use of the 2000 HCM.

The Town of Malta adopted the Final Comprehensive Master Plan and Generic Environmental Impact Statement in 2005. This update to their 2000 Comprehensive Plan included the Luther Forest Technology Campus Planned Development District. The findings of the 2005 GEIS were based on capacity/level of service analysis utilizing the 2000 version of the HCM. We recommend that the Town of Malta as the SEQRA lead agency consider the continued use of the 2000 HCM for capacity/level of service analysis for proposed projects which relate to the 2005 GEIS in order to maintain consistency with the findings of the 2005 GEIS.

If you have any questions or would like to discuss this further, please contact me at (518) 457-5283.

Sincerely,

Mark J. Kennedy
Regional Traffic Engineer

cc: Rob Cherry, Dir. of Transportation Planning, R-1 Planning & Prog. Mgmt., 6th Floor
Paul Sausville, Supervisor, Town of Malta
Anthony Tozzi, Building and Planning Coordinator, Town of Malta
Wendy Holsberger, Creighton Manning Engineering

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R9MAEnbam
Date: 1/25/11
Period: AM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext

Inter.: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 No-Build

N/S St: Rt 9

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
LGConfig		LTR			LTR		L	TR		L	TR	
Volume	175	20	170	15	25	40	100	490	15	10	425	145
Lane Width		10.0			10.0		10.0	11.0		10.0	11.0	
RTOR Vol			25			20			0			41

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru		A		
	Right	A					Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru		A		
	Right	A					Right		A		
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		39.0						15.0	25.0		
Yellow		4.0						4.0	4.0		
All Red		1.0						1.0	2.0		

Cycle Length: 95.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	502	1224	0.74	0.41	29.7	C	29.7	C
Westbound								
LTR	599	1458	0.11	0.41	17.4	B	17.4	B
Northbound								
L	218	1381	0.50	0.16	38.5	D		
TR	886	3367	0.63	0.26	32.3	C	33.3	C
Southbound								
L	266	1685	0.04	0.16	34.0	C		
TR	835	3173	0.70	0.26	34.1	C	34.1	C

Intersection Delay = 32.2 (sec/veh) Intersection LOS = C

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
E-Mail: cme@cmellp.com

OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R9MAEnbam
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 No-Build
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext N/S St: Rt 9

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	175	20	170	15	25	40	100	490	15	10	425	145
% Heavy Veh	7	17	12	13	0	2	22	3	17	0	6	11
PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PK 15 Vol	48	5	47	4	7	11	27	135	4	3	117	40
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900		1900	1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
LGConfig		LTR			LTR		L	TR		L	TR	
Lane Width		10.0			10.0		10.0	11.0		10.0	11.0	
RTOR Vol			25			20			0			41
Adj Flow		373			65		110	554		11	581	
%InSharedLn												
Prop LTs		0.515			0.246			0.000			0.000	
Prop RTs	0.426			0.338			0.029			0.196		
Peds Bikes	0			0			0			0		
Buses		0			0		0	0		0	0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
WB	Left	A				SB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		39.0					15.0	25.0	
Yellow		4.0					4.0	4.0	
All Red		1.0					1.0	2.0	

Cycle Length: 95.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	175	20	170	15	25	40	100	490	15	10	425	145
PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj flow	192	22	159	16	27	22	110	538	16	11	467	114
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Lane group		LTR			LTR		L	TR		L	TR	
Adj flow		373			65		110	554		11	581	
Prop LTs		0.515			0.246			0.000			0.000	
Prop RTs		0.426			0.338			0.029			0.196	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG	LTR			LTR			L	TR		L	TR	
So	1900			1900			1900	1900		1900	1900	
Lanes	0	1	0	0	1	0	1	2	0	1	2	0
fW		0.933			0.933		0.933	0.967		0.933	0.967	
fHV		0.911			0.963		0.820	0.967		1.000	0.935	
fG		1.000			1.000		1.000	1.000		1.000	1.000	
fP		1.000			1.000		1.000	1.000		1.000	1.000	
fBB		1.000			1.000		1.000	1.000		1.000	1.000	
fA		1.000			1.000		1.000	1.000		1.000	1.000	
fLU		1.000			1.000		1.000	0.952		1.000	0.952	
fRT		0.942			0.954			0.996			0.971	
fLT		0.804			0.895		0.950	1.000		0.950	1.000	
Sec.												
fLpb		1.000			1.000		1.000	1.000		1.000	1.000	
fRpb		1.000			1.000			1.000			1.000	
S		1224			1458		1381	3367		1685	3173	
Sec.												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	373	1224	# 0.30	0.41	502	0.74
Right							
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	65	1458	0.04	0.41	599	0.11
Right							
Northbound							
Prot							
Perm							
Left	L	110	1381	# 0.08	0.16	218	0.50
Prot							
Perm							
Thru	TR	554	3367	0.16	0.26	886	0.63
Right							
Southbound							
Prot							
Perm							
Left	L	11	1685	0.01	0.16	266	0.04
Prot							
Perm							
Thru	TR	581	3173	# 0.18	0.26	835	0.70
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.57
Total lost time per cycle, L = 16.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.68

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.74	0.41	23.7	1.000	502	0.30	5.9	0.0	29.7	C	29.7	C
Westbound												
LTR	0.11	0.41	17.3	1.000	599	0.11	0.1	0.0	17.4	B	17.4	B
Northbound												
L	0.50	0.16	36.6	1.000	218	0.11	1.9	0.0	38.5	D		
TR	0.63	0.26	30.9	1.000	886	0.21	1.4	0.0	32.3	C	33.3	C
Southbound												
L	0.04	0.16	33.9	1.000	266	0.11	0.1	0.0	34.0	C		
TR	0.70	0.26	31.6	1.000	835	0.26	2.5	0.0	34.1	C	34.1	C

Intersection delay = 32.2 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	95.0 sec				
Total actual green time for LT lane group, G (s)					
Effective permitted green time for LT lane group, g(s)					
Opposing effective green time, go (s)					
Number of lanes in LT lane group, N					
Number of lanes in opposing approach, No					
Adjusted LT flow rate, VLT (veh/h)					
Proportion of LT in LT lane group, PLT					
Proportion of LT in opposing flow, PLTo					
Adjusted opposing flow rate, Vo (veh/h)					
Lost time for LT lane group, tL					
Computation					
LT volume per cycle, LTC=VLTC/3600					
Opposing lane util. factor, fLUo		1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)					
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g					
Opposing platoon ratio, Rpo (refer Exhibit 16-11)					
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]					
gq, (see Exhibit C16-4,5,6,7,8)					
gu=g-gq if gq>=gf, or = g-gf if gq<gf					
n=Max(gq-gf)/2,0)					
PTHo=1-PLTo					
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]					
EL1 (refer to Exhibit C16-3)					
EL2=Max((1-Ptho**n)/Plto, 1.0)					
fmin=2(1+PL)/g or fmin=2(1+Pl)/g					
gdiff=max(gq-gf,0)					
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)					
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)], (fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT					

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	95.0 sec				
Total actual green time for LT lane group, G (s)		39.0	39.0		
Effective permitted green time for LT lane group, g(s)		39.0	39.0		
Opposing effective green time, go (s)		39.0	39.0		
Number of lanes in LT lane group, N		1	1		

Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	192	16		
Proportion of LT in LT lane group, PLT	0.515	0.246	0.000	0.000
Proportion of LT in opposing flow, PLTo	0.25	0.51		
Adjusted opposing flow rate, Vo (veh/h)	65	373		
Lost time for LT lane group, tL	5.00	5.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	5.07	0.42		
Opposing lane util. factor, fLUo	1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	1.72	9.84		
gf=G[exp(- a * (LTC ** b)]-tl, gf<=g	0.0	18.7		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.59	0.59		
gq, (see Exhibit C16-4,5,6,7,8)	0.00	11.11		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	39.00	20.35		
n=Max(gq-gf)/2,0)	0.00	0.00		
PTHo=1-PLTo	0.75	0.49		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	0.51	0.25		
EL1 (refer to Exhibit C16-3)	1.47	2.03		
EL2=Max((1-Ptho**n)/Plto, 1.0)	1.00	1.00		
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.08	0.06		
gdiff=max(gq-gf,0)	0.00	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.80	0.89		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.804	0.895		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	95.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						
v/c ratio from Capacity Worksheet, X						
Protected phase effective green interval, g (s)						
Opposing queue effective green interval, gq						
Unopposed green interval, gu						
Red time r=(C-g-gq-gu)						
Arrival rate, qa=v/(3600(max[X,1.0]))						
Protected ph. departure rate, Sp=s/3600						
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						
XPerm						
XProt						
Case						
Queue at beginning of green arrow, Qa						
Queue at beginning of unsaturated green, Qu						
Residual queue, Qr						
Uniform Delay, d1						

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
	0.0						0.0	
LTR	0.0	0.00	28.0	23.7	0.00	0.0	0.0	29.7
	0.0						0.0	
Westbound								
	0.0						0.0	
LTR	0.0	0.00	28.0	17.3	0.00	0.0	0.0	17.4
	0.0						0.0	
Northbound								
L	0.0	0.00	40.0	36.6	0.00	0.0	0.0	38.5
TR	0.0	0.00	35.0	30.9	0.00	0.0	0.0	32.3
	0.0						0.0	
Southbound								
L	0.0	0.00	40.0	33.9	0.00	0.0	0.0	34.0
TR	0.0	0.00	35.0	31.6	0.00	0.0	0.0	34.1
	0.0						0.0	

Intersection Delay 32.2 sec/veh Intersection LOS C

BACK OF QUEUE WORKSHEET

	Eastbound	Westbound	Northbound		Southbound	
LaneGroup	LTR	LTR	L	TR	L	TR
Init Queue	0.0	0.0	0.0	0.0	0.0	0.0
Flow Rate	373	65	110	290	11	305
So	1900	1900	1900	1900	1900	1900
No.Lanes	0 1 0	0 1 0	1	2 0	1	2 0
SL	1224	1458	1381	1768	1685	1666
LnCapacity	502	599	218	465	266	438
Flow Ratio	0.3	0.0	0.1	0.2	0.0	0.2
v/c Ratio	0.74	0.11	0.50	0.62	0.04	0.70
Grn Ratio	0.41	0.41	0.16	0.26	0.16	0.26
I Factor	1.000	1.000		1.000		1.000
AT or PVG	3	3	3	3	3	3
Pltn Ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF2	1.00	1.00	1.00	1.00	1.00	1.00
Q1	8.3	1.1	2.7	6.7	0.2	7.3
kB	0.5	0.5	0.3	0.5	0.3	0.4
Q2	1.3	0.1	0.3	0.7	0.0	0.9
Q Average	9.6	1.1	2.9	7.5	0.3	8.2
Q Spacing	24.9	24.9	24.9	24.9	24.9	24.9
Q Storage	0	0	0	0	0	0
Q S Ratio						
70th Percentile Output:						
fB%	1.2	1.2	1.2	1.2	1.2	1.2
BOQ	11.3	1.3	3.5	8.8	0.3	9.7
QSRatio						
85th Percentile Output:						
fB%	1.5	1.6	1.6	1.5	1.6	1.5
BOQ	14.6	1.8	4.6	11.5	0.4	12.5
QSRatio						
90th Percentile Output:						
fB%	1.6	1.8	1.7	1.7	1.8	1.7
BOQ	15.8	2.0	5.1	12.5	0.5	13.7
QSRatio						
95th Percentile Output:						
fB%	1.9	2.1	2.0	1.9	2.1	1.9
BOQ	17.8	2.3	5.9	14.2	0.5	15.4
QSRatio						
98th Percentile Output:						
fB%	2.2	2.6	2.5	2.3	2.7	2.2
BOQ	20.9	2.9	7.3	16.9	0.7	18.3
QSRatio						

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R9MAEbuam
Date: 1/25/11
Period: AM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext

Inter.: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build

N/S St: Rt 9

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
LGConfig		LTR			LTR		L	TR		L	TR	
Volume	175	20	170	15	25	40	100	510	15	10	595	145
Lane Width		10.0			10.0		10.0	11.0		10.0	11.0	
RTOR Vol			25			20			0			41

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru		A		
	Right	A					Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru		A		
	Right	A					Right		A		
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		39.0						15.0	25.0		
Yellow		4.0						4.0	4.0		
All Red		1.0						1.0	2.0		

Cycle Length: 95.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	502	1224	0.74	0.41	29.7	C	29.7	C
Westbound								
LTR	599	1458	0.11	0.41	17.4	B	17.4	B
Northbound								
L	218	1381	0.50	0.16	38.5	D		
TR	886	3368	0.65	0.26	32.8	C	33.7	C
Southbound								
L	266	1685	0.04	0.16	34.0	C		
TR	843	3203	0.91	0.26	47.9	D	47.7	D

Intersection Delay = 38.1 (sec/veh) Intersection LOS = D

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R9MAEbuam
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext N/S St: Rt 9

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	175	20	170	15	25	40	100	510	15	10	595	145
% Heavy Veh	7	17	12	13	0	2	22	3	17	0	6	11
PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PK 15 Vol	48	5	47	4	7	11	27	140	4	3	163	40
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900		1900	1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
LGConfig		LTR			LTR		L	TR		L	TR	
Lane Width		10.0			10.0		10.0	11.0		10.0	11.0	
RTOR Vol			25			20			0			41
Adj Flow		373			65		110	576		11	768	
%InSharedLn												
Prop LTs		0.515			0.246			0.000			0.000	
Prop RTs	0.426			0.338			0.028			0.148		
Peds Bikes	0			0			0			0		
Buses		0			0		0	0		0	0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
WB	Left	A				SB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		39.0					15.0	25.0	
Yellow		4.0					4.0	4.0	
All Red		1.0					1.0	2.0	

Cycle Length: 95.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	175	20	170	15	25	40	100	510	15	10	595	145
PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj flow	192	22	159	16	27	22	110	560	16	11	654	114
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Lane group		LTR			LTR		L	TR		L	TR	
Adj flow		373			65		110	576		11	768	
Prop LTs		0.515			0.246			0.000			0.000	
Prop RTs		0.426			0.338			0.028			0.148	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG	LTR			LTR			L	TR		L	TR	
So	1900			1900			1900	1900		1900	1900	
Lanes	0 1	0	0	1	0		1	2	0	1	2	0
fW	0.933			0.933			0.933	0.967		0.933	0.967	
fHV	0.911			0.963			0.820	0.967		1.000	0.937	
fG	1.000			1.000			1.000	1.000		1.000	1.000	
fP	1.000			1.000			1.000	1.000		1.000	1.000	
fBB	1.000			1.000			1.000	1.000		1.000	1.000	
fA	1.000			1.000			1.000	1.000		1.000	1.000	
fLU	1.000			1.000			1.000	0.952		1.000	0.952	
fRT	0.942			0.954				0.996			0.978	
fLT	0.804			0.895			0.950	1.000		0.950	1.000	
Sec.												
fLpb	1.000			1.000			1.000	1.000		1.000	1.000	
fRpb	1.000			1.000				1.000			1.000	
S	1224			1458			1381	3368		1685	3203	
Sec.												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	373	1224	# 0.30	0.41	502	0.74
Right							
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	65	1458	0.04	0.41	599	0.11
Right							
Northbound							
Prot							
Perm							
Left	L	110	1381	# 0.08	0.16	218	0.50
Prot							
Perm							
Thru	TR	576	3368	0.17	0.26	886	0.65
Right							
Southbound							
Prot							
Perm							
Left	L	11	1685	0.01	0.16	266	0.04
Prot							
Perm							
Thru	TR	768	3203	# 0.24	0.26	843	0.91
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.62
Total lost time per cycle, L = 16.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.75

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.74	0.41	23.7	1.000	502	0.30	5.9	0.0	29.7	C	29.7	C
Westbound												
LTR	0.11	0.41	17.3	1.000	599	0.11	0.1	0.0	17.4	B	17.4	B
Northbound												
L	0.50	0.16	36.6	1.000	218	0.11	1.9	0.0	38.5	D		
TR	0.65	0.26	31.1	1.000	886	0.23	1.7	0.0	32.8	C	33.7	C
Southbound												
L	0.04	0.16	33.9	1.000	266	0.11	0.1	0.0	34.0	C		
TR	0.91	0.26	33.9	1.000	843	0.43	14.0	0.0	47.9	D	47.7	D

Intersection delay = 38.1 (sec/veh) Intersection LOS = D

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	95.0 sec				
Total actual green time for LT lane group, G (s)					
Effective permitted green time for LT lane group, g(s)					
Opposing effective green time, go (s)					
Number of lanes in LT lane group, N					
Number of lanes in opposing approach, No					
Adjusted LT flow rate, VLT (veh/h)					
Proportion of LT in LT lane group, PLT					
Proportion of LT in opposing flow, PLTo					
Adjusted opposing flow rate, Vo (veh/h)					
Lost time for LT lane group, tL					
Computation					
LT volume per cycle, LTC=VLTC/3600					
Opposing lane util. factor, fLUo		1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)					
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g					
Opposing platoon ratio, Rpo (refer Exhibit 16-11)					
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]					
gq, (see Exhibit C16-4,5,6,7,8)					
gu=g-gq if gq>=gf, or = g-gf if gq<gf					
n=Max(gq-gf)/2,0)					
PTHo=1-PLTo					
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]					
EL1 (refer to Exhibit C16-3)					
EL2=Max((1-Ptho**n)/Plto, 1.0)					
fmin=2(1+PL)/g or fmin=2(1+Pl)/g					
gdiff=max(gq-gf,0)					
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)					
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)], (fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT					

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	95.0 sec				
Total actual green time for LT lane group, G (s)		39.0	39.0		
Effective permitted green time for LT lane group, g(s)		39.0	39.0		
Opposing effective green time, go (s)		39.0	39.0		
Number of lanes in LT lane group, N		1	1		

Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	192	16		
Proportion of LT in LT lane group, PLT	0.515	0.246	0.000	0.000
Proportion of LT in opposing flow, PLTo	0.25	0.51		
Adjusted opposing flow rate, Vo (veh/h)	65	373		
Lost time for LT lane group, tL	5.00	5.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	5.07	0.42		
Opposing lane util. factor, fLUo	1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	1.72	9.84		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	18.7		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.59	0.59		
gq, (see Exhibit C16-4,5,6,7,8)	0.00	11.11		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	39.00	20.35		
n=Max(gq-gf)/2,0)	0.00	0.00		
PTHo=1-PLTo	0.75	0.49		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	0.51	0.25		
EL1 (refer to Exhibit C16-3)	1.47	2.03		
EL2=Max((1-Ptho**n)/Plto, 1.0)	1.00	1.00		
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.08	0.06		
gdiff=max(gq-gf,0)	0.00	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.80	0.89		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.804	0.895		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	95.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						
v/c ratio from Capacity Worksheet, X						
Protected phase effective green interval, g (s)						
Opposing queue effective green interval, gq						
Unopposed green interval, gu						
Red time r=(C-g-gq-gu)						
Arrival rate, qa=v/(3600(max[X,1.0]))						
Protected ph. departure rate, Sp=s/3600						
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						
XPerm						
XProt						
Case						
Queue at beginning of green arrow, Qa						
Queue at beginning of unsaturated green, Qu						
Residual queue, Qr						
Uniform Delay, d1						

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
	0.0						0.0	
LTR	0.0	0.00	28.0	23.7	0.00	0.0	0.0	29.7
	0.0						0.0	
Westbound								
	0.0						0.0	
LTR	0.0	0.00	28.0	17.3	0.00	0.0	0.0	17.4
	0.0						0.0	
Northbound								
L	0.0	0.00	40.0	36.6	0.00	0.0	0.0	38.5
TR	0.0	0.00	35.0	31.1	0.00	0.0	0.0	32.8
	0.0						0.0	
Southbound								
L	0.0	0.00	40.0	33.9	0.00	0.0	0.0	34.0
TR	0.0	0.00	35.0	33.9	0.00	0.0	0.0	47.9
	0.0						0.0	

Intersection Delay 38.1 sec/veh Intersection LOS D

BACK OF QUEUE WORKSHEET

	Eastbound	Westbound	Northbound		Southbound	
LaneGroup	LTR	LTR	L	TR	L	TR
Init Queue	0.0	0.0	0.0	0.0	0.0	0.0
Flow Rate	373	65	110	302	11	403
So	1900	1900	1900	1900	1900	1900
No.Lanes	0 1 0	0 1 0	1	2 0	1	2 0
SL	1224	1458	1381	1768	1685	1682
LnCapacity	502	599	218	465	266	442
Flow Ratio	0.3	0.0	0.1	0.2	0.0	0.2
v/c Ratio	0.74	0.11	0.50	0.65	0.04	0.91
Grn Ratio	0.41	0.41	0.16	0.26	0.16	0.26
I Factor	1.000	1.000		1.000		1.000
AT or PVG	3	3	3	3	3	3
Pltn Ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF2	1.00	1.00	1.00	1.00	1.00	1.00
Q1	8.3	1.1	2.7	7.1	0.2	10.3
kB	0.5	0.5	0.3	0.5	0.3	0.4
Q2	1.3	0.1	0.3	0.8	0.0	2.8
Q Average	9.6	1.1	2.9	7.9	0.3	13.2
Q Spacing	24.9	24.9	24.9	24.9	24.9	24.9
Q Storage	0	0	0	0	0	0
Q S Ratio						
70th Percentile Output:						
fB%	1.2	1.2	1.2	1.2	1.2	1.2
BOQ	11.3	1.3	3.5	9.3	0.3	15.4
QSRatio						
85th Percentile Output:						
fB%	1.5	1.6	1.6	1.5	1.6	1.5
BOQ	14.6	1.8	4.6	12.1	0.4	19.7
QSRatio						
90th Percentile Output:						
fB%	1.6	1.8	1.7	1.7	1.8	1.6
BOQ	15.8	2.0	5.1	13.2	0.5	21.1
QSRatio						
95th Percentile Output:						
fB%	1.9	2.1	2.0	1.9	2.1	1.8
BOQ	17.8	2.3	5.9	14.9	0.5	23.5
QSRatio						
98th Percentile Output:						
fB%	2.2	2.6	2.5	2.2	2.7	2.1
BOQ	20.9	2.9	7.3	17.7	0.7	27.2
QSRatio						

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R9MAEbuami
Date: 1/25/11
Period: AM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext

Inter.: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build with Imp

N/S St: Rt 9

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	0	1	0	1	2	0	1	2	0
LGConfig		LT	R		LTR		L	TR		L	TR	
Volume	175	20	170	15	25	40	100	510	15	10	595	145
Lane Width		10.0	12.0		10.0		10.0	11.0		10.0	11.0	
RTOR Vol			25			20			0			41

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru	A					Thru		A		
Right	A					Right		A		
Peds						Peds				
WB Left	A				SB	Left	A			
Thru	A					Thru		A		
Right	A					Right		A		
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right				
Green	33.0						20.0	34.0		
Yellow	4.0						4.0	4.0		
All Red	1.0						1.0	2.0		

Cycle Length: 103.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LT	370	1156	0.58	0.32	31.5	C	29.6	C
R	462	1442	0.34	0.32	27.2	C		
Westbound								
LTR	479	1494	0.14	0.32	25.0	C	25.0	C
Northbound								
L	268	1381	0.41	0.19	37.4	D		
TR	1112	3368	0.52	0.33	28.3	C	29.8	C
Southbound								
L	327	1685	0.03	0.19	33.7	C		
TR	1057	3203	0.73	0.33	32.9	C	33.0	C

Intersection Delay = 30.9 (sec/veh) Intersection LOS = C

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R9MAEbuami
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build with Imp
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext N/S St: Rt 9

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	175	20	170	15	25	40	100	510	15	10	595	145
% Heavy Veh	7	17	12	13	0	2	22	3	17	0	6	11
PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PK 15 Vol	48	5	47	4	7	11	27	140	4	3	163	40
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900	1900		1900		1900	1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	0	1	1	0	1	0	1	2	0	1	2	0
LGConfig		LT	R		LTR		L	TR		L	TR	
Lane Width		10.0	12.0		10.0		10.0	11.0		10.0	11.0	
RTOR Vol			25			20			0			41
Adj Flow		214	159		65		110	576		11	768	
%InSharedLn												
Prop LTs		0.897			0.246			0.000			0.000	
Prop RTs	0.000		1.000	0.338			0.028			0.148		
Peds Bikes	0			0			0			0		
Buses		0	0		0		0	0		0	0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
WB	Left	A				SB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		33.0					20.0	34.0	
Yellow		4.0					4.0	4.0	
All Red		1.0					1.0	2.0	

Cycle Length: 103.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	175	20	170	15	25	40	100	510	15	10	595	145
PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj flow	192	22	159	16	27	22	110	560	16	11	654	114
No. Lanes	0	1	1	0	1	0	1	2	0	1	2	0
Lane group		LT	R		LTR		L	TR		L	TR	
Adj flow		214	159		65		110	576		11	768	
Prop LTs		0.897			0.246			0.000			0.000	
Prop RTs		0.000	1.000		0.338			0.028			0.148	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound		Northbound			Southbound	
LG	LT	R		LTR		L	TR		L	TR
So	1900	1900		1900		1900	1900		1900	1900
Lanes 0	1	1	0	1	0	1	2	0	1	2 0
fW	0.933	1.000		0.933		0.933	0.967		0.933	0.967
fHV	0.926	0.893		0.963		0.820	0.967		1.000	0.937
fG	1.000	1.000		1.000		1.000	1.000		1.000	1.000
fP	1.000	1.000		1.000		1.000	1.000		1.000	1.000
fBB	1.000	1.000		1.000		1.000	1.000		1.000	1.000
fA	1.000	1.000		1.000		1.000	1.000		1.000	1.000
fLU	1.000	1.000		1.000		1.000	0.952		1.000	0.952
fRT	1.000	0.850		0.954			0.996			0.978
fLT	0.704			0.917		0.950	1.000		0.950	1.000
Sec.										
fLpb	1.000			1.000		1.000	1.000		1.000	1.000
fRpb	1.000	1.000		1.000			1.000			1.000
S	1156	1442		1494		1381	3368		1685	3203
Sec.										

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LT	214	1156	# 0.19	0.32	370	0.58
Right	R	159	1442	0.11	0.32	462	0.34
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	65	1494	0.04	0.32	479	0.14
Right							
Northbound							
Prot							
Perm							
Left	L	110	1381	# 0.08	0.19	268	0.41
Prot							
Perm							
Thru	TR	576	3368	0.17	0.33	1112	0.52
Right							
Southbound							
Prot							
Perm							
Left	L	11	1685	0.01	0.19	327	0.03
Prot							
Perm							
Thru	TR	768	3203	# 0.24	0.33	1057	0.73
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.50
Total lost time per cycle, L = 16.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.60

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LT	0.58	0.32	29.2	1.000	370	0.17	2.3	0.0	31.5	C	29.6	C
R	0.34	0.32	26.7	1.000	462	0.11	0.4	0.0	27.2	C		
Westbound												
LTR	0.14	0.32	24.9	1.000	479	0.11	0.1	0.0	25.0	C	25.0	C
Northbound												
L	0.41	0.19	36.3	1.000	268	0.11	1.0	0.0	37.4	D		
TR	0.52	0.33	27.9	1.000	1112	0.12	0.4	0.0	28.3	C	29.8	C
Southbound												
L	0.03	0.19	33.7	1.000	327	0.11	0.0	0.0	33.7	C		
TR	0.73	0.33	30.4	1.000	1057	0.29	2.5	0.0	32.9	C	33.0	C

Intersection delay = 30.9 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	103.0 sec				
Total actual green time for LT lane group, G (s)					
Effective permitted green time for LT lane group, g(s)					
Opposing effective green time, go (s)					
Number of lanes in LT lane group, N					
Number of lanes in opposing approach, No					
Adjusted LT flow rate, VLT (veh/h)					
Proportion of LT in LT lane group, PLT					
Proportion of LT in opposing flow, PLTo					
Adjusted opposing flow rate, Vo (veh/h)					
Lost time for LT lane group, tL					
Computation					
LT volume per cycle, LTC=VLTC/3600					
Opposing lane util. factor, fLUo		1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)					
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g					
Opposing platoon ratio, Rpo (refer Exhibit 16-11)					
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]					
gq, (see Exhibit C16-4,5,6,7,8)					
gu=g-gq if gq>=gf, or = g-gf if gq<gf					
n=Max(gq-gf)/2,0)					
PTHo=1-PLTo					
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]					
EL1 (refer to Exhibit C16-3)					
EL2=Max((1-Ptho**n)/Plto, 1.0)					
fmin=2(1+PL)/g or fmin=2(1+Pl)/g					
gdiff=max(gq-gf,0)					
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)					
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT					

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	103.0 sec				
Total actual green time for LT lane group, G (s)		33.0	33.0		
Effective permitted green time for LT lane group, g(s)		33.0	33.0		
Opposing effective green time, go (s)		33.0	33.0		
Number of lanes in LT lane group, N		1	1		

Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	192	16		
Proportion of LT in LT lane group, PLT	0.897	0.246	0.000	0.000
Proportion of LT in opposing flow, PLTo	0.25	0.90		
Adjusted opposing flow rate, Vo (veh/h)	65	214		
Lost time for LT lane group, tL	5.00	5.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	5.49	0.46		
Opposing lane util. factor, fLUo	1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	1.86	6.12		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	14.9		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.68	0.68		
gq, (see Exhibit C16-4,5,6,7,8)	0.26	8.05		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	32.74	18.06		
n=Max(gq-gf)/2,0)	0.13	0.00		
PTHo=1-PLTo	0.75	0.10		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	0.90	0.25		
EL1 (refer to Exhibit C16-3)	1.47	1.72		
EL2=Max((1-Ptho**n)/Plto, 1.0)	1.00	1.00		
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.11	0.08		
gdiff=max(gq-gf,0)	0.26	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.70	0.92		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.704	0.917		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	103.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v					
v/c ratio from Capacity Worksheet, X					
Protected phase effective green interval, g (s)					
Opposing queue effective green interval, gq					
Unopposed green interval, gu					
Red time r=(C-g-gq-gu)					
Arrival rate, qa=v/(3600(max[X,1.0]))					
Protected ph. departure rate, Sp=s/3600					
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)					
XPerm					
XProt					
Case					
Queue at beginning of green arrow, Qa					
Queue at beginning of unsaturated green, Qu					
Residual queue, Qr					
Uniform Delay, d1					

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
	0.0						0.0	
LT	0.0	0.00	35.0	29.2	0.00	0.0	0.0	31.5
R	0.0	0.00	35.0	26.7	0.00	0.0	0.0	27.2
Westbound								
	0.0						0.0	
LTR	0.0	0.00	35.0	24.9	0.00	0.0	0.0	25.0
	0.0						0.0	
Northbound								
L	0.0	0.00	41.5	36.3	0.00	0.0	0.0	37.4
TR	0.0	0.00	34.5	27.9	0.00	0.0	0.0	28.3
	0.0						0.0	
Southbound								
L	0.0	0.00	41.5	33.7	0.00	0.0	0.0	33.7
TR	0.0	0.00	34.5	30.4	0.00	0.0	0.0	32.9
	0.0						0.0	

Intersection Delay 30.9 sec/veh Intersection LOS C

BACK OF QUEUE WORKSHEET

	Eastbound		Westbound		Northbound		Southbound	
LaneGroup	LT	R	LTR		L	TR	L	TR
Init Queue	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Flow Rate	214	159	65		110	302	11	403
So	1900	1900	1900		1900	1900	1900	1900
No.Lanes	0 1	1	0 1	0	1	2 0	1	2 0
SL	1156	1442	1494		1381	1768	1685	1682
LnCapacity	370	462	479		268	584	327	555
Flow Ratio	0.2	0.1	0.0		0.1	0.2	0.0	0.2
v/c Ratio	0.58	0.34	0.14		0.41	0.52	0.03	0.73
Grn Ratio	0.32	0.32	0.32		0.19	0.33	0.19	0.33
I Factor	1.000		1.000			1.000		1.000
AT or PVG	3	3	3		3	3	3	3
Pltn Ratio	1.00	1.00	1.00		1.00	1.00	1.00	1.00
PF2	1.00	1.00	1.00		1.00	1.00	1.00	1.00
Q1	5.1	3.5	1.3		2.8	7.0	0.3	10.2
kB	0.4	0.5	0.5		0.3	0.5	0.4	0.5
Q2	0.5	0.2	0.1		0.2	0.6	0.0	1.3
Q Average	5.7	3.7	1.4		3.0	7.6	0.3	11.5
Q Spacing	24.9	25.0	24.9		24.9	24.9	24.9	24.9
Q Storage	0	0	0		0	0	0	0
Q S Ratio								
70th Percentile Output:								
fB%	1.2	1.2	1.2		1.2	1.2	1.2	1.2
BOQ	6.7	4.4	1.7		3.6	8.9	0.3	13.5
QSRatio								
85th Percentile Output:								
fB%	1.5	1.6	1.6		1.6	1.5	1.6	1.5
BOQ	8.8	5.8	2.2		4.7	11.6	0.4	17.2
QSRatio								
90th Percentile Output:								
fB%	1.7	1.7	1.8		1.7	1.7	1.8	1.6
BOQ	9.6	6.4	2.5		5.2	12.6	0.5	18.6
QSRatio								
95th Percentile Output:								
fB%	1.9	2.0	2.1		2.0	1.9	2.1	1.8
BOQ	11.0	7.4	2.9		6.0	14.3	0.6	20.8
QSRatio								
98th Percentile Output:								
fB%	2.3	2.5	2.6		2.5	2.3	2.7	2.1
BOQ	13.3	9.1	3.6		7.5	17.1	0.7	24.2
QSRatio								

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R9MAEnbpm
Date: 1/25/11
Period: PM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext

Inter.: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 No-Build

N/S St: Rt 9

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
LGConfig		LTR			LTR		L	TR		L	TR	
Volume	250	30	150	25	45	45	215	750	45	35	600	375
Lane Width		10.0			10.0		10.0	11.0		10.0	11.0	
RTOR Vol			31			13			1			87

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru	A					Thru		A		
Right	A					Right		A		
Peds						Peds				
WB Left	A				SB	Left	A			
Thru	A					Thru		A		
Right	A					Right		A		
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right				
Green	39.0						15.0	25.0		
Yellow	4.0						4.0	4.0		
All Red	1.0						1.0	2.0		

Cycle Length: 95.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	517	1259	0.87	0.41	40.3	D	40.3	D
Westbound								
LTR	582	1417	0.20	0.41	18.1	B	18.1	B
Northbound								
L	258	1636	0.94	0.16	78.5	E		
TR	894	3398	1.00	0.26	64.5	E	67.5	E
Southbound								
L	266	1685	0.15	0.16	34.6	C		
TR	864	3283	1.16	0.26	117.9	F	114.7	F

Intersection Delay = 78.9 (sec/veh) Intersection LOS = E

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
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OPERATIONAL ANALYSIS

Analyst:	MDN
Agency/Co.:	CME, R9MAEnbpm
Date Performed:	1/25/11
Analysis Time Period:	PM PH of AST
Intersection:	Rt 9/Malta Ave/Ext
Area Type:	All other areas
Jurisdiction:	Malta, Saratoga County
Analysis Year:	2022 No-Build

Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext N/S St: Rt 9

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	250	30	150	25	45	45	215	750	45	35	600	375
% Heavy Veh	2	3	1	4	4	0	3	2	3	0	1	2
PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PK 15 Vol	70	8	42	7	13	13	60	211	13	10	169	105
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900		1900	1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
LGConfig		LTR			LTR		L	TR		L	TR	
Lane Width		10.0			10.0		10.0	11.0		10.0	11.0	
RTOR Vol			31			13			1			87
Adj Flow		449			115		242	892		39	998	
%InSharedLn												
Prop LTs		0.626			0.243			0.000			0.000	
Prop RTs	0.298			0.313			0.055			0.325		
Peds Bikes	0			0			0			0		
Buses		0			0		0	0		0	0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
WB	Left	A				SB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		39.0					15.0	25.0	
Yellow		4.0					4.0	4.0	
All Red		1.0					1.0	2.0	

Cycle Length: 95.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	250	30	150	25	45	45	215	750	45	35	600	375
PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj flow	281	34	134	28	51	36	242	843	49	39	674	324
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Lane group		LTR			LTR		L	TR		L	TR	
Adj flow		449			115		242	892		39	998	
Prop LTs		0.626			0.243			0.000			0.000	
Prop RTs		0.298			0.313			0.055			0.325	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG	LTR			LTR			L	TR		L	TR	
So	1900			1900			1900	1900		1900	1900	
Lanes	0 1	0	0	1	0		1	2	0	1	2	0
fW	0.933			0.933			0.933	0.967		0.933	0.967	
fHV	0.983			0.973			0.971	0.980		1.000	0.987	
fG	1.000			1.000			1.000	1.000		1.000	1.000	
fP	1.000			1.000			1.000	1.000		1.000	1.000	
fBB	1.000			1.000			1.000	1.000		1.000	1.000	
fA	1.000			1.000			1.000	1.000		1.000	1.000	
fLU	1.000			1.000			1.000	0.952		1.000	0.952	
fRT	0.960			0.958				0.992			0.951	
fLT	0.753			0.857			0.950	1.000		0.950	1.000	
Sec.												
fLpb	1.000			1.000			1.000	1.000		1.000	1.000	
fRpb	1.000			1.000				1.000			1.000	
S	1259			1417			1636	3398		1685	3283	
Sec.												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	449	1259	# 0.36	0.41	517	0.87
Right							
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	115	1417	0.08	0.41	582	0.20
Right							
Northbound							
Prot							
Perm							
Left	L	242	1636	# 0.15	0.16	258	0.94
Prot							
Perm							
Thru	TR	892	3398	0.26	0.26	894	1.00
Right							
Southbound							
Prot							
Perm							
Left	L	39	1685	0.02	0.16	266	0.15
Prot							
Perm							
Thru	TR	998	3283	# 0.30	0.26	864	1.16
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.81
Total lost time per cycle, L = 16.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.97

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.87	0.41	25.7	1.000	517	0.40	14.6	0.0	40.3	D	40.3	D
Westbound												
LTR	0.20	0.41	18.0	1.000	582	0.11	0.2	0.0	18.1	B	18.1	B
Northbound												
L	0.94	0.16	39.5	1.000	258	0.44	39.0	0.0	78.5	E		
TR	1.00	0.26	35.0	1.000	894	0.50	29.5	0.0	64.5	E	67.5	E
Southbound												
L	0.15	0.16	34.5	1.000	266	0.04	0.1	0.0	34.6	C		
TR	1.16	0.26	35.0	1.000	864	0.50	82.9	0.0	117.9	F	114.7	F

Intersection delay = 78.9 (sec/veh) Intersection LOS = E

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	95.0 sec				
Total actual green time for LT lane group, G (s)					
Effective permitted green time for LT lane group, g(s)					
Opposing effective green time, go (s)					
Number of lanes in LT lane group, N					
Number of lanes in opposing approach, No					
Adjusted LT flow rate, VLT (veh/h)					
Proportion of LT in LT lane group, PLT					
Proportion of LT in opposing flow, PLTo					
Adjusted opposing flow rate, Vo (veh/h)					
Lost time for LT lane group, tL					
Computation					
LT volume per cycle, LTC=VLTC/3600					
Opposing lane util. factor, fLUo		1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)					
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g					
Opposing platoon ratio, Rpo (refer Exhibit 16-11)					
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]					
gq, (see Exhibit C16-4,5,6,7,8)					
gu=g-gq if gq>=gf, or = g-gf if gq<gf					
n=Max(gq-gf)/2,0)					
PTHo=1-PLTo					
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]					
EL1 (refer to Exhibit C16-3)					
EL2=Max((1-Ptho**n)/Plto, 1.0)					
fmin=2(1+PL)/g or fmin=2(1+Pl)/g					
gdiff=max(gq-gf,0)					
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)					
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT					

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	95.0 sec				
Total actual green time for LT lane group, G (s)		39.0	39.0		
Effective permitted green time for LT lane group, g(s)		39.0	39.0		
Opposing effective green time, go (s)		39.0	39.0		
Number of lanes in LT lane group, N		1	1		

Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	281	28		
Proportion of LT in LT lane group, PLT	0.626	0.243	0.000	0.000
Proportion of LT in opposing flow, PLTo	0.24	0.63		
Adjusted opposing flow rate, Vo (veh/h)	115	449		
Lost time for LT lane group, tL	5.00	5.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	7.42	0.74		
Opposing lane util. factor, fLUo	1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	3.03	11.85		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	14.2		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.59	0.59		
gq, (see Exhibit C16-4,5,6,7,8)	1.57	13.56		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	37.43	24.84		
n=Max(gq-gf)/2,0)	0.79	0.00		
PTHo=1-PLTo	0.76	0.37		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	0.63	0.24		
EL1 (refer to Exhibit C16-3)	1.55	2.19		
EL2=Max((1-Ptho**n)/Plto, 1.0)	1.00	1.00		
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.08	0.06		
gdiff=max(gq-gf,0)	1.57	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.75	0.86		

flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**

Left-turn adjustment, fLT	0.753	0.857

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	95.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						
v/c ratio from Capacity Worksheet, X						
Protected phase effective green interval, g (s)						
Opposing queue effective green interval, gq						
Unopposed green interval, gu						
Red time r=(C-g-gq-gu)						
Arrival rate, qa=v/(3600(max[X,1.0]))						
Protected ph. departure rate, Sp=s/3600						
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						
XPerm						
XProt						
Case						
Queue at beginning of green arrow, Qa						
Queue at beginning of unsaturated green, Qu						
Residual queue, Qr						
Uniform Delay, d1						

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
	0.0						0.0	
LTR	0.0	0.00	28.0	25.7	0.00	0.0	0.0	40.3
	0.0						0.0	
Westbound								
	0.0						0.0	
LTR	0.0	0.00	28.0	18.0	0.00	0.0	0.0	18.1
	0.0						0.0	
Northbound								
L	0.0	0.00	40.0	39.5	0.00	0.0	0.0	78.5
TR	0.0	0.00	35.0	35.0	0.00	0.0	0.0	64.5
	0.0						0.0	
Southbound								
L	0.0	0.00	40.0	34.5	0.00	0.0	0.0	34.6
TR	0.0	0.00	35.0	35.0	0.00	33.5	0.0	117.9
	0.0						0.0	

Intersection Delay 78.9 sec/veh Intersection LOS E

BACK OF QUEUE WORKSHEET

	Eastbound	Westbound	Northbound	Southbound
LaneGroup	LTR	LTR	L TR	L TR
Init Queue	0.0	0.0	0.0 0.0	0.0 0.0
Flow Rate	449	115	242 468	39 524
So	1900	1900	1900 1900	1900 1900
No.Lanes	0 1 0	0 1 0	1 2 0	1 2 0
SL	1259	1417	1636 1784	1685 1724
LnCapacity	517	582	258 469	266 453
Flow Ratio	0.4	0.1	0.1 0.3	0.0 0.3
v/c Ratio	0.87	0.20	0.94 1.00	0.15 1.16
Grn Ratio	0.41	0.41	0.16 0.26	0.16 0.26
I Factor	1.000	1.000	1.000	1.000
AT or PVG	3	3	3 3	3 3
Pltn Ratio	1.00	1.00	1.00 1.00	1.00 1.00
PF2	1.00	1.00	1.00 1.00	1.00 1.00
Q1	10.9	1.9	6.3 12.3	0.9 13.8
kB	0.5	0.5	0.3 0.5	0.3 0.4
Q2	2.5	0.1	2.3 5.1	0.1 11.4
Q Average	13.3	2.1	8.6 17.4	0.9 25.2
Q Spacing	24.9	24.9	24.9 24.9	24.9 24.9
Q Storage	0	0	0 0	0 0
Q S Ratio				
70th Percentile Output:				
fB%	1.2	1.2	1.2 1.2	1.2 1.2
BOQ	15.6	2.5	10.1 20.3	1.1 29.1
QSRatio				
85th Percentile Output:				
fB%	1.5	1.6	1.5 1.5	1.6 1.4
BOQ	19.9	3.3	13.1 25.6	1.5 36.1
QSRatio				
90th Percentile Output:				
fB%	1.6	1.8	1.7 1.6	1.8 1.5
BOQ	21.4	3.7	14.2 27.3	1.7 38.2
QSRatio				
95th Percentile Output:				
fB%	1.8	2.0	1.9 1.7	2.1 1.6
BOQ	23.8	4.2	16.0 30.1	2.0 41.6
QSRatio				
98th Percentile Output:				
fB%	2.1	2.6	2.2 2.0	2.6 1.8
BOQ	27.4	5.3	19.0 34.2	2.5 46.5
QSRatio				

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R9MAEbupm
Date: 1/25/11
Period: PM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext

Inter.: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build

N/S St: Rt 9

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
LGConfig		LTR			LTR		L	TR		L	TR	
Volume	250	30	150	25	45	45	215	900	45	35	630	375
Lane Width		10.0			10.0		10.0	11.0		10.0	11.0	
RTOR Vol			31			13			1			87

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru		A		
	Right	A					Right		A		
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru		A		
	Right	A					Right		A		
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		39.0						15.0	25.0		
Yellow		4.0						4.0	4.0		
All Red		1.0						1.0	2.0		

Cycle Length: 95.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	517	1259	0.87	0.41	40.3	D	40.3	D
Westbound								
LTR	582	1417	0.20	0.41	18.1	B	18.1	B
Northbound								
L	258	1636	0.94	0.16	78.5	E		
TR	896	3403	1.18	0.26	128.8	F	119.4	F
Southbound								
L	266	1685	0.15	0.16	34.6	C		
TR	866	3289	1.19	0.26	132.7	F	129.1	F

Intersection Delay = 106.9 (sec/veh) Intersection LOS = F

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
E-Mail: cme@cmellp.com

OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R9MAEbupm
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext N/S St: Rt 9

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	250	30	150	25	45	45	215	900	45	35	630	375
% Heavy Veh	2	3	1	4	4	0	3	2	3	0	1	2
PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PK 15 Vol	70	8	42	7	13	13	60	253	13	10	177	105
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900		1900	1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
LGConfig		LTR			LTR		L	TR		L	TR	
Lane Width		10.0			10.0		10.0	11.0		10.0	11.0	
RTOR Vol			31			13			1			87
Adj Flow		449			115		242	1060		39	1032	
%InSharedLn												
Prop LTs		0.626			0.243			0.000			0.000	
Prop RTs	0.298			0.313			0.046			0.314		
Peds Bikes	0			0			0			0		
Buses		0			0		0	0		0	0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
WB	Left	A				SB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		39.0					15.0	25.0	
Yellow		4.0					4.0	4.0	
All Red		1.0					1.0	2.0	

Cycle Length: 95.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	250	30	150	25	45	45	215	900	45	35	630	375
PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj flow	281	34	134	28	51	36	242	1011	49	39	708	324
No. Lanes	0	1	0	0	1	0	1	2	0	1	2	0
Lane group	LTR			LTR			L	TR		L	TR	
Adj flow	449			115			242	1060		39	1032	
Prop LTs	0.626			0.243			0.000			0.000		
Prop RTs	0.298			0.313			0.046			0.314		

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG	LTR			LTR			L	TR		L	TR	
So	1900			1900			1900	1900		1900	1900	
Lanes 0	1	0	0	1	0		1	2	0	1	2	0
fW	0.933			0.933			0.933	0.967		0.933	0.967	
fHV	0.983			0.973			0.971	0.980		1.000	0.987	
fG	1.000			1.000			1.000	1.000		1.000	1.000	
fP	1.000			1.000			1.000	1.000		1.000	1.000	
fBB	1.000			1.000			1.000	1.000		1.000	1.000	
fA	1.000			1.000			1.000	1.000		1.000	1.000	
fLU	1.000			1.000			1.000	0.952		1.000	0.952	
fRT	0.960			0.958				0.993			0.953	
fLT	0.753			0.857			0.950	1.000		0.950	1.000	
Sec.												
fLpb	1.000			1.000			1.000	1.000		1.000	1.000	
fRpb	1.000			1.000				1.000			1.000	
S	1259			1417			1636	3403		1685	3289	
Sec.												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	449	1259	# 0.36	0.41	517	0.87
Right							
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	115	1417	0.08	0.41	582	0.20
Right							
Northbound							
Prot							
Perm							
Left	L	242	1636	# 0.15	0.16	258	0.94
Prot							
Perm							
Thru	TR	1060	3403	0.31	0.26	896	1.18
Right							
Southbound							
Prot							
Perm							
Left	L	39	1685	0.02	0.16	266	0.15
Prot							
Perm							
Thru	TR	1032	3289	# 0.31	0.26	866	1.19
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.82
Total lost time per cycle, L = 16.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.98

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.87	0.41	25.7	1.000	517	0.40	14.6	0.0	40.3	D	40.3	D
Westbound												
LTR	0.20	0.41	18.0	1.000	582	0.11	0.2	0.0	18.1	B	18.1	B
Northbound												
L	0.94	0.16	39.5	1.000	258	0.44	39.0	0.0	78.5	E		
TR	1.18	0.26	35.0	1.000	896	0.50	93.8	0.0	128.8	F	119.4	F
Southbound												
L	0.15	0.16	34.5	1.000	266	0.04	0.1	0.0	34.6	C		
TR	1.19	0.26	35.0	1.000	866	0.50	97.7	0.0	132.7	F	129.1	F

Intersection delay = 106.9 (sec/veh) Intersection LOS = F

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	95.0 sec				
Total actual green time for LT lane group, G (s)					
Effective permitted green time for LT lane group, g(s)					
Opposing effective green time, go (s)					
Number of lanes in LT lane group, N					
Number of lanes in opposing approach, No					
Adjusted LT flow rate, VLT (veh/h)					
Proportion of LT in LT lane group, PLT					
Proportion of LT in opposing flow, PLTo					
Adjusted opposing flow rate, Vo (veh/h)					
Lost time for LT lane group, tL					
Computation					
LT volume per cycle, LTC=VLTC/3600					
Opposing lane util. factor, fLUo		1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)					
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g					
Opposing platoon ratio, Rpo (refer Exhibit 16-11)					
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]					
gq, (see Exhibit C16-4,5,6,7,8)					
gu=g-gq if gq>=gf, or = g-gf if gq<gf					
n=Max(gq-gf)/2,0)					
PTHo=1-PLTo					
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]					
EL1 (refer to Exhibit C16-3)					
EL2=Max((1-Ptho**n)/Plto, 1.0)					
fmin=2(1+PL)/g or fmin=2(1+Pl)/g					
gdiff=max(gq-gf,0)					
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)					
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT					

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	95.0 sec				
Total actual green time for LT lane group, G (s)		39.0	39.0		
Effective permitted green time for LT lane group, g(s)		39.0	39.0		
Opposing effective green time, go (s)		39.0	39.0		
Number of lanes in LT lane group, N		1	1		

Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	281	28		
Proportion of LT in LT lane group, PLT	0.626	0.243	0.000	0.000
Proportion of LT in opposing flow, PLTo	0.24	0.63		
Adjusted opposing flow rate, Vo (veh/h)	115	449		
Lost time for LT lane group, tL	5.00	5.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	7.42	0.74		
Opposing lane util. factor, fLUo	1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	3.03	11.85		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	14.2		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.59	0.59		
gq, (see Exhibit C16-4,5,6,7,8)	1.57	13.56		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	37.43	24.84		
n=Max(gq-gf)/2,0)	0.79	0.00		
PTHo=1-PLTo	0.76	0.37		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	0.63	0.24		
EL1 (refer to Exhibit C16-3)	1.55	2.19		
EL2=Max((1-Ptho**n)/Plto, 1.0)	1.00	1.00		
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.08	0.06		
gdiff=max(gq-gf,0)	1.57	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.75	0.86		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.753	0.857		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	95.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						
v/c ratio from Capacity Worksheet, X						
Protected phase effective green interval, g (s)						
Opposing queue effective green interval, gq						
Unopposed green interval, gu						
Red time r=(C-g-gq-gu)						
Arrival rate, qa=v/(3600(max[X,1.0]))						
Protected ph. departure rate, Sp=s/3600						
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						
XPerm						
XProt						
Case						
Queue at beginning of green arrow, Qa						
Queue at beginning of unsaturated green, Qu						
Residual queue, Qr						
Uniform Delay, d1						

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
	0.0						0.0	
LTR	0.0	0.00	28.0	25.7	0.00	0.0	0.0	40.3
	0.0						0.0	
Westbound								
	0.0						0.0	
LTR	0.0	0.00	28.0	18.0	0.00	0.0	0.0	18.1
	0.0						0.0	
Northbound								
L	0.0	0.00	40.0	39.5	0.00	0.0	0.0	78.5
TR	0.0	0.00	35.0	35.0	0.00	41.0	0.0	128.8
	0.0						0.0	
Southbound								
L	0.0	0.00	40.0	34.5	0.00	0.0	0.0	34.6
TR	0.0	0.00	35.0	35.0	0.00	41.5	0.0	132.7
	0.0						0.0	

Intersection Delay 106.9 sec/veh Intersection LOS F

BACK OF QUEUE WORKSHEET

	Eastbound	Westbound	Northbound	Southbound
LaneGroup	LTR	LTR	L TR	L TR
Init Queue	0.0	0.0	0.0 0.0	0.0 0.0
Flow Rate	449	115	242 556	39 542
So	1900	1900	1900 1900	1900 1900
No.Lanes	0 1 0	0 1 0	1 2 0	1 2 0
SL	1259	1417	1636 1787	1685 1727
LnCapacity	517	582	258 470	266 454
Flow Ratio	0.4	0.1	0.1 0.3	0.0 0.3
v/c Ratio	0.87	0.20	0.94 1.18	0.15 1.19
Grn Ratio	0.41	0.41	0.16 0.26	0.16 0.26
I Factor	1.000	1.000	1.000	1.000
AT or PVG	3	3	3 3	3 3
Pltn Ratio	1.00	1.00	1.00 1.00	1.00 1.00
PF2	1.00	1.00	1.00 1.00	1.00 1.00
Q1	10.9	1.9	6.3 14.7	0.9 14.3
kB	0.5	0.5	0.3 0.5	0.3 0.4
Q2	2.5	0.1	2.3 13.1	0.1 13.3
Q Average	13.3	2.1	8.6 27.8	0.9 27.6
Q Spacing	24.9	24.9	24.9 24.9	24.9 24.9
Q Storage	0	0	0 0	0 0
Q S Ratio				
70th Percentile Output:				
fB%	1.2	1.2	1.2 1.1	1.2 1.2
BOQ	15.6	2.5	10.1 32.0	1.1 31.7
QSRatio				
85th Percentile Output:				
fB%	1.5	1.6	1.5 1.4	1.6 1.4
BOQ	19.9	3.3	13.1 39.5	1.5 39.1
QSRatio				
90th Percentile Output:				
fB%	1.6	1.8	1.7 1.5	1.8 1.5
BOQ	21.4	3.7	14.2 41.7	1.7 41.4
QSRatio				
95th Percentile Output:				
fB%	1.8	2.0	1.9 1.6	2.1 1.6
BOQ	23.8	4.2	16.0 45.3	2.0 44.9
QSRatio				
98th Percentile Output:				
fB%	2.1	2.6	2.2 1.8	2.6 1.8
BOQ	27.4	5.3	19.0 50.6	2.5 50.2
QSRatio				

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R9MAEbupmi
Date: 1/25/11
Period: PM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext

Inter.: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build with Imp

N/S St: Rt 9

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	0	1	0	1	2	0	1	2	0
LGConfig		LT	R		LTR		L	TR		L	TR	
Volume	250	30	150	25	45	45	215	900	45	35	630	375
Lane Width		10.0	12.0		10.0		10.0	11.0		10.0	11.0	
RTOR Vol			31			13			1			87

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru	A					Thru		A		
Right	A					Right		A		
Peds						Peds				
WB Left	A				SB	Left	A			
Thru	A					Thru		A		
Right	A					Right		A		
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right				
Green	33.0						20.0	34.0		
Yellow	4.0						4.0	4.0		
All Red	1.0						1.0	2.0		

Cycle Length: 103.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LT	375	1169	0.84	0.32	48.1	D	41.6	D
R	512	1599	0.26	0.32	26.2	C		
Westbound								
LTR	438	1368	0.26	0.32	26.3	C	26.3	C
Northbound								
L	318	1636	0.76	0.19	48.5	D		
TR	1123	3403	0.94	0.33	48.9	D	48.8	D
Southbound								
L	327	1685	0.12	0.19	34.3	C		
TR	1086	3289	0.95	0.33	50.4	D	49.8	D

Intersection Delay = 47.2 (sec/veh) Intersection LOS = D

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
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Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R9MAEbupmi
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Rt 9/Malta Ave/Ext
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build with Imp
Project ID: 110-255, GF Malta TIS
E/W St: Malta Ave/Malta Ave Ext N/S St: Rt 9

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	250	30	150	25	45	45	215	900	45	35	630	375
% Heavy Veh	2	3	1	4	4	0	3	2	3	0	1	2
PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PK 15 Vol	70	8	42	7	13	13	60	253	13	10	177	105
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900	1900		1900		1900	1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	0	1	1	0	1	0	1	2	0	1	2	0
LGConfig		LT	R		LTR		L	TR		L	TR	
Lane Width		10.0	12.0		10.0		10.0	11.0		10.0	11.0	
RTOR Vol			31			13			1			87
Adj Flow		315	134		115		242	1060		39	1032	
%InSharedLn												
Prop LTs		0.892			0.243			0.000			0.000	
Prop RTs	0.000		1.000	0.313			0.046			0.314		
Peds Bikes	0			0			0			0		
Buses		0	0		0		0	0		0	0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
WB	Left	A				SB Left	A		
	Thru	A				Thru		A	
	Right	A				Right		A	
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		33.0					20.0	34.0	
Yellow		4.0					4.0	4.0	
All Red		1.0					1.0	2.0	

Cycle Length: 103.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	250	30	150	25	45	45	215	900	45	35	630	375
PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj flow	281	34	134	28	51	36	242	1011	49	39	708	324
No. Lanes	0	1	1	0	1	0	1	2	0	1	2	0
Lane group		LT	R		LTR		L	TR		L	TR	
Adj flow		315	134		115		242	1060		39	1032	
Prop LTs		0.892			0.243			0.000			0.000	
Prop RTs		0.000	1.000		0.313			0.046			0.314	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound		Northbound			Southbound		
LG	LT	R		LTR		L	TR		L	TR	
So	1900	1900		1900		1900	1900		1900	1900	
Lanes	1	1	0	1	0	1	2	0	1	2	0
fW	0.933	1.000		0.933		0.933	0.967		0.933	0.967	
fHV	0.979	0.990		0.973		0.971	0.980		1.000	0.987	
fG	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
fP	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
fBB	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
fA	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
fLU	1.000	1.000		1.000		1.000	0.952		1.000	0.952	
fRT	1.000	0.850		0.958			0.993			0.953	
fLT	0.673			0.828		0.950	1.000		0.950	1.000	
Sec.											
fLpb	1.000			1.000		1.000	1.000		1.000	1.000	
fRpb	1.000	1.000		1.000			1.000			1.000	
S	1169	1599		1368		1636	3403		1685	3289	
Sec.											

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LT	315	1169	# 0.27	0.32	375	0.84
Right	R	134	1599	0.08	0.32	512	0.26
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	115	1368	0.08	0.32	438	0.26
Right							
Northbound							
Prot							
Perm							
Left	L	242	1636	# 0.15	0.19	318	0.76
Prot							
Perm							
Thru	TR	1060	3403	0.31	0.33	1123	0.94
Right							
Southbound							
Prot							
Perm							
Left	L	39	1685	0.02	0.19	327	0.12
Prot							
Perm							
Thru	TR	1032	3289	# 0.31	0.33	1086	0.95
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.73
Total lost time per cycle, L = 16.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.87

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LT	0.84	0.32	32.5	1.000	375	0.38	15.6	0.0	48.1	D	41.6	D
R	0.26	0.32	26.0	1.000	512	0.11	0.3	0.0	26.2	C		
Westbound												
LTR	0.26	0.32	26.0	1.000	438	0.11	0.3	0.0	26.3	C	26.3	C
Northbound												
L	0.76	0.19	39.2	1.000	318	0.28	9.3	0.0	48.5	D		
TR	0.94	0.33	33.6	1.000	1123	0.46	15.3	0.0	48.9	D	48.8	D
Southbound												
L	0.12	0.19	34.2	1.000	327	0.04	0.1	0.0	34.3	C		
TR	0.95	0.33	33.7	1.000	1086	0.46	16.7	0.0	50.4	D	49.8	D

Intersection delay = 47.2 (sec/veh) Intersection LOS = D

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	103.0 sec				
Total actual green time for LT lane group, G (s)					
Effective permitted green time for LT lane group, g(s)					
Opposing effective green time, go (s)					
Number of lanes in LT lane group, N					
Number of lanes in opposing approach, No					
Adjusted LT flow rate, VLT (veh/h)					
Proportion of LT in LT lane group, PLT					
Proportion of LT in opposing flow, PLTo					
Adjusted opposing flow rate, Vo (veh/h)					
Lost time for LT lane group, tL					
Computation					
LT volume per cycle, LTC=VLTC/3600					
Opposing lane util. factor, fLUo		1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)					
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g					
Opposing platoon ratio, Rpo (refer Exhibit 16-11)					
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]					
gq, (see Exhibit C16-4,5,6,7,8)					
gu=g-gq if gq>=gf, or = g-gf if gq<gf					
n=Max(gq-gf)/2,0)					
PTHo=1-PLTo					
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]					
EL1 (refer to Exhibit C16-3)					
EL2=Max((1-Ptho**n)/Plto, 1.0)					
fmin=2(1+PL)/g or fmin=2(1+Pl)/g					
gdiff=max(gq-gf,0)					
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)					
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT					

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	103.0 sec				
Total actual green time for LT lane group, G (s)		33.0	33.0		
Effective permitted green time for LT lane group, g(s)		33.0	33.0		
Opposing effective green time, go (s)		33.0	33.0		
Number of lanes in LT lane group, N		1	1		

Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	281	28		
Proportion of LT in LT lane group, PLT	0.892	0.243	0.000	0.000
Proportion of LT in opposing flow, PLTo	0.24	0.89		
Adjusted opposing flow rate, Vo (veh/h)	115	315		
Lost time for LT lane group, tL	5.00	5.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	8.04	0.80		
Opposing lane util. factor, fLUo	1.000	1.000	0.952	0.952
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	3.29	9.01		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	10.6		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.68	0.68		
gq, (see Exhibit C16-4,5,6,7,8)	3.13	12.52		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	29.87	20.48		
n=Max(gq-gf)/2,0)	1.57	0.99		
PTHo=1-PLTo	0.76	0.11		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	0.89	0.24		
EL1 (refer to Exhibit C16-3)	1.55	1.91		
EL2=Max((1-Ptho**n)/Plto, 1.0)	1.45	1.00		
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.11	0.08		
gdiff=max(gq-gf,0)	3.13	1.97		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.67	0.83		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.673	0.828		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	103.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v					
v/c ratio from Capacity Worksheet, X					
Protected phase effective green interval, g (s)					
Opposing queue effective green interval, gq					
Unopposed green interval, gu					
Red time r=(C-g-gq-gu)					
Arrival rate, qa=v/(3600(max[X,1.0]))					
Protected ph. departure rate, Sp=s/3600					
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)					
XPerm					
XProt					
Case					
Queue at beginning of green arrow, Qa					
Queue at beginning of unsaturated green, Qu					
Residual queue, Qr					
Uniform Delay, d1					

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
	0.0						0.0	
LT	0.0	0.00	35.0	32.5	0.00	0.0	0.0	48.1
R	0.0	0.00	35.0	26.0	0.00	0.0	0.0	26.2
Westbound								
	0.0						0.0	
LTR	0.0	0.00	35.0	26.0	0.00	0.0	0.0	26.3
	0.0						0.0	
Northbound								
L	0.0	0.00	41.5	39.2	0.00	0.0	0.0	48.5
TR	0.0	0.00	34.5	33.6	0.00	0.0	0.0	48.9
	0.0						0.0	
Southbound								
L	0.0	0.00	41.5	34.2	0.00	0.0	0.0	34.3
TR	0.0	0.00	34.5	33.7	0.00	0.0	0.0	50.4
	0.0						0.0	

Intersection Delay 47.2 sec/veh Intersection LOS D

BACK OF QUEUE WORKSHEET

	Eastbound		Westbound			Northbound			Southbound		
LaneGroup	LT	R	LTR			L	TR		L	TR	
Init Queue	0.0	0.0	0.0			0.0	0.0		0.0	0.0	
Flow Rate	315	134	115			242	556		39	542	
So	1900	1900	1900			1900	1900		1900	1900	
No.Lanes	0 1	1	0 1		0	1	2	0	1	2	0
SL	1169	1599	1368			1636	1787		1685	1727	
LnCapacity	375	512	438			318	589		327	570	
Flow Ratio	0.3	0.1	0.1			0.1	0.3		0.0	0.3	
v/c Ratio	0.84	0.26	0.26			0.76	0.94		0.12	0.95	
Grn Ratio	0.32	0.32	0.32			0.19	0.33		0.19	0.33	
I Factor	1.000		1.000				1.000			1.000	
AT or PVG	3	3	3			3	3		3	3	
Pltn Ratio	1.00	1.00	1.00			1.00	1.00		1.00	1.00	
PF2	1.00	1.00	1.00			1.00	1.00		1.00	1.00	
Q1	8.4	2.8	2.4			6.5	15.5		0.9	15.1	
kB	0.4	0.5	0.5			0.4	0.5		0.4	0.5	
Q2	1.8	0.2	0.2			1.1	4.4		0.1	4.5	
Q Average	10.1	3.0	2.6			7.6	19.9		1.0	19.7	
Q Spacing	24.9	25.0	24.9			24.9	24.9		24.9	24.9	
Q Storage	0	0	0			0	0		0	0	
Q S Ratio											
70th Percentile Output:											
fB%	1.2	1.2	1.2			1.2	1.2		1.2	1.2	
BOQ	11.9	3.6	3.1			9.0	23.1		1.2	22.8	
QSRatio											
85th Percentile Output:											
fB%	1.5	1.6	1.6			1.5	1.5		1.6	1.5	
BOQ	15.4	4.7	4.1			11.7	29.0		1.5	28.6	
QSRatio											
90th Percentile Output:											
fB%	1.6	1.7	1.8			1.7	1.5		1.8	1.5	
BOQ	16.6	5.3	4.6			12.8	30.8		1.7	30.5	
QSRatio											
95th Percentile Output:											
fB%	1.8	2.0	2.0			1.9	1.7		2.1	1.7	
BOQ	18.7	6.1	5.3			14.4	33.8		2.0	33.4	
QSRatio											
98th Percentile Output:											
fB%	2.2	2.5	2.5			2.3	1.9		2.6	1.9	
BOQ	21.9	7.5	6.6			17.2	38.1		2.6	37.7	
QSRatio											

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R67ELnbam
Date: 1/25/11
Period: AM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67

Inter.: Rt 67/East Line Rd
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 No-Build

N/S St: East Line Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	15	735	100	135	480	30	120	40	160	160	100	30
Lane Width	11.0	11.0		11.0	11.0			11.0			12.0	
RTOR Vol			4			2			25			2

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		29.0						15.0			
Yellow		4.0						4.0			
All Red		2.0						2.0			

Cycle Length: 56.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	365	704	0.04	0.52	6.7	A		
TR	890	1718	0.97	0.52	36.8	D	36.3	D
Westbound								
L	131	253	1.08	0.52	114.0	F		
TR	891	1720	0.59	0.52	10.5	B	32.3	C
Northbound								
LTR	344	1285	0.90	0.27	44.3	D	44.3	D
Southbound								
LTR	331	1234	0.91	0.27	47.1	D	47.1	D

Intersection Delay = 37.7 (sec/veh) Intersection LOS = D

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
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Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R67ELnbam
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Rt 67/East Line Rd
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 No-Build
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67 N/S St: East Line Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	15	735	100	135	480	30	120	40	160	160	100	30
% Heavy Veh	0	4	13	0	6	4	1	5	2	1	1	3
PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
PK 15 Vol	4	191	26	35	125	8	31	10	42	42	26	8
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900			1900			1900	
ParkExist												
NumPark												
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Lane Width	11.0	11.0		11.0	11.0			11.0			12.0	
RTOR Vol			4			2			25			2
Adj Flow	16	866		141	529			308			300	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000			0.406			0.557	
Prop RTs		0.115			0.055			0.458			0.097	
Peds Bikes		0			0			0			0	
Buses	0	0		0	0			0			0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru	A		
	Right	A				Right	A		
	Peds					Peds			
WB	Left	A				SB Left	A		
	Thru	A				Thru	A		
	Right	A				Right	A		
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		29.0				15.0			
Yellow		4.0				4.0			
All Red		2.0				2.0			

Cycle Length: 56.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	15	735	100	135	480	30	120	40	160	160	100	30
PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj flow	16	766	100	141	500	29	125	42	141	167	104	29
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Lane group	L	TR		L	TR		LTR			LTR		
Adj flow	16	866		141	529		308			300		
Prop LTs	1.000	0.000		1.000	0.000		0.406			0.557		
Prop RTs	0.115			0.055			0.458			0.097		

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG	L	TR		L	TR		LTR			LTR		
So	1900	1900		1900	1900		1900			1900		
Lanes	1	1	0	1	1	0	0	1	0	0	1	0
fW	0.967	0.967		0.967	0.967			0.967			1.000	
fHV	1.000	0.952		1.000	0.944			0.980			0.988	
fG	1.000	1.000		1.000	1.000			1.000			1.000	
fP	1.000	1.000		1.000	1.000			1.000			1.000	
fBB	1.000	1.000		1.000	1.000			1.000			1.000	
fA	1.000	1.000		1.000	1.000			1.000			1.000	
fLU	1.000	1.000		1.000	1.000			1.000			1.000	
fRT		0.983			0.992			0.938			0.987	
fLT	0.383	1.000		0.138	1.000			0.761			0.666	
Sec.												
fLpb	1.000	1.000		1.000	1.000			1.000			1.000	
fRpb		1.000			1.000			1.000			1.000	
S	704	1718		253	1720			1285			1234	
Sec.												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left	L	16	704	0.02	0.52	365	0.04
Prot							
Perm							
Thru	TR	866	1718	0.50	0.52	890	0.97
Right							
Westbound							
Prot							
Perm							
Left	L	141	253	# 0.56	0.52	131	1.08
Prot							
Perm							
Thru	TR	529	1720	0.31	0.52	891	0.59
Right							
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	308	1285	0.24	0.27	344	0.90
Right							
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	300	1234	# 0.24	0.27	331	0.91
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.80
Total lost time per cycle, L = 12.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.02

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.04	0.52	6.7	1.000	365	0.11	0.0	0.0	6.7	A		
TR	0.97	0.52	13.1	1.000	890	0.48	23.7	0.0	36.8	D	36.3	D
Westbound												
L	1.08	0.52	13.5	1.000	131	0.50	100.5	0.0	114.0	F		
TR	0.59	0.52	9.4	1.000	891	0.18	1.1	0.0	10.5	B	32.3	C
Northbound												
LTR	0.90	0.27	19.7	1.000	344	0.42	24.6	0.0	44.3	D	44.3	D
Southbound												
LTR	0.91	0.27	19.8	1.000	331	0.43	27.3	0.0	47.1	D	47.1	D

Intersection delay = 37.7 (sec/veh) Intersection LOS = D

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 56.0 sec				
Total actual green time for LT lane group, G (s)	29.0	29.0		
Effective permitted green time for LT lane group, g(s)	29.0	29.0		
Opposing effective green time, go (s)	29.0	29.0		
Number of lanes in LT lane group, N	1	1		
Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	16	141		
Proportion of LT in LT lane group, PLT	1.000	1.000		
Proportion of LT in opposing flow, PLTo	0.00	0.00		
Adjusted opposing flow rate, Vo (veh/h)	529	866		
Lost time for LT lane group, tL	6.00	6.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	0.25	2.19		
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	8.23	13.47		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	0.0		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.48	0.48		
gq, (see Exhibit C16-4,5,6,7,8)	5.24	19.03		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	23.76	9.97		
n=Max(gq-gf)/2,0)	2.62	9.52		
PTHo=1-PLTo	1.00	1.00		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00	1.00		
EL1 (refer to Exhibit C16-3)	2.14	2.93		
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.14	0.14		
gdiff=max(gq-gf,0)	0.00	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.38	0.14		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.383	0.138		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 56.0 sec				
Total actual green time for LT lane group, G (s)			15.0	15.0
Effective permitted green time for LT lane group, g(s)			15.0	15.0
Opposing effective green time, go (s)			15.0	15.0
Number of lanes in LT lane group, N			1	1

Number of lanes in opposing approach, No			1	1
Adjusted LT flow rate, VLT (veh/h)			125	167
Proportion of LT in LT lane group, PLT	0.000	0.000	0.406	0.557
Proportion of LT in opposing flow, PLTo			0.56	0.41
Adjusted opposing flow rate, Vo (veh/h)			300	308
Lost time for LT lane group, tL			6.00	6.00
Computation				
LT volume per cycle, LTC=VLTC/3600			1.94	2.60
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			4.67	4.79
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g			0.0	0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)			1.00	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]			0.73	0.73
gq, (see Exhibit C16-4,5,6,7,8)			5.48	5.72
gu=g-gq if gq>=gf, or = g-gf if gq<gf			9.52	9.28
n=Max(gq-gf)/2,0)			2.74	2.86
PTHo=1-PLTo			0.44	0.59
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]			0.41	0.56
EL1 (refer to Exhibit C16-3)			1.88	1.90
EL2=Max((1-Ptho**n)/Plto, 1.0)			1.60	1.91
fmin=2(1+PL)/g or fmin=2(1+Pl)/g			0.19	0.21
gdiff=max(gq-gf,0)			5.48	5.72
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)			0.76	0.67
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT			0.761	0.666

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	56.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						
v/c ratio from Capacity Worksheet, X						
Protected phase effective green interval, g (s)						
Opposing queue effective green interval, gq						
Unopposed green interval, gu						
Red time r=(C-g-gq-gu)						
Arrival rate, qa=v/(3600(max[X,1.0]))						
Protected ph. departure rate, Sp=s/3600						
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						
XPerm						
XProt						
Case						
Queue at beginning of green arrow, Qa						
Queue at beginning of unsaturated green, Qu						
Residual queue, Qr						
Uniform Delay, d1						

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00	13.5	6.7	0.00	0.0	0.0	6.7
TR	0.0	0.00	13.5	13.1	0.00	0.0	0.0	36.8
	0.0						0.0	
Westbound								
L	0.0	0.00	13.5	13.5	0.00	2.5	0.0	114.0
TR	0.0	0.00	13.5	9.4	0.00	0.0	0.0	10.5
	0.0						0.0	
Northbound								
	0.0						0.0	
LTR	0.0	0.00	20.5	19.7	0.00	0.0	0.0	44.3
	0.0						0.0	
Southbound								
	0.0						0.0	
LTR	0.0	0.00	20.5	19.8	0.00	0.0	0.0	47.1
	0.0						0.0	

Intersection Delay 37.7 sec/veh Intersection LOS D

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	TR		L	TR			LTR			LTR	
Init Queue	0.0	0.0		0.0	0.0			0.0			0.0	
Flow Rate	16	866		141	529			308			300	
So	1900	1900		1900	1900			1900			1900	
No.Lanes	1	1	0	1	1	0	0	1	0	0	1	0
SL	704	1718		253	1720			1285			1234	
LnCapacity	365	890		131	891			344			331	
Flow Ratio	0.0	0.5		0.6	0.3			0.2			0.2	
v/c Ratio	0.04	0.97		1.08	0.59			0.90			0.91	
Grn Ratio	0.52	0.52		0.52	0.52			0.27			0.27	
I Factor		1.000			1.000			1.000			1.000	
AT or PVG	3	3		3	3			3			3	
Pltn Ratio	1.00	1.00		1.00	1.00			1.00			1.00	
PF2	1.00	1.00		1.00	1.00			1.00			1.00	
Q1	0.1	13.1		2.2	5.7			4.6			4.5	
kB	0.3	0.5		0.2	0.5			0.3			0.3	
Q2	0.0	5.9		2.4	0.7			1.7			1.8	
Q Average	0.1	19.0		4.6	6.4			6.3			6.3	
Q Spacing	24.9	24.9		24.9	24.9			24.9			24.9	
Q Storage	0	0		0	0			0			0	
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2		1.2	1.2			1.2			1.2	
BOQ	0.2	22.1		5.4	7.6			7.5			7.5	
QSRatio												
85th Percentile Output:												
fB%	1.6	1.5		1.6	1.5			1.5			1.5	
BOQ	0.2	27.7		7.1	9.9			9.7			9.7	
QSRatio												
90th Percentile Output:												
fB%	1.8	1.6		1.7	1.7			1.7			1.7	
BOQ	0.2	29.5		7.9	10.9			10.7			10.6	
QSRatio												
95th Percentile Output:												
fB%	2.1	1.7		2.0	1.9			1.9			1.9	
BOQ	0.3	32.4		9.0	12.3			12.1			12.1	
QSRatio												
98th Percentile Output:												
fB%	2.7	1.9		2.4	2.3			2.3			2.3	
BOQ	0.4	36.7		11.0	14.8			14.6			14.6	
QSRatio												

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R67ELbuam
Date: 1/25/11
Period: AM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67

Inter.: Rt 67/East Line Rd
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build

N/S St: East Line Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	15	835	100	135	490	30	120	40	160	160	100	30
Lane Width	11.0	11.0		11.0	11.0			11.0			12.0	
RTOR Vol			4			2			25			2

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		29.0						15.0			
Yellow		4.0						4.0			
All Red		2.0						2.0			

Cycle Length: 56.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	356	688	0.04	0.52	6.7	A		
TR	892	1723	1.09	0.52	70.3	E	69.2	E
Westbound								
L	131	253	1.08	0.52	114.0	F		
TR	891	1720	0.60	0.52	10.7	B	32.1	C
Northbound								
LTR	344	1285	0.90	0.27	44.3	D	44.3	D
Southbound								
LTR	331	1234	0.91	0.27	47.1	D	47.1	D

Intersection Delay = 51.8 (sec/veh) Intersection LOS = D

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
E-Mail: cme@cmellp.com

OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R67ELbuam
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Rt 67/East Line Rd
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67 N/S St: East Line Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	15	835	100	135	490	30	120	40	160	160	100	30
% Heavy Veh	0	4	13	0	6	4	1	5	2	1	1	3
PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
PK 15 Vol	4	217	26	35	128	8	31	10	42	42	26	8
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900			1900			1900	
ParkExist												
NumPark												
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Lane Width	11.0	11.0		11.0	11.0			11.0			12.0	
RTOR Vol			4			2			25			2
Adj Flow	16	970		141	539			308			300	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000			0.406			0.557	
Prop RTs		0.103			0.054			0.458			0.097	
Peds Bikes		0			0			0			0	
Buses	0	0		0	0			0			0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru	A		
	Right	A				Right	A		
	Peds					Peds			
WB	Left	A				SB Left	A		
	Thru	A				Thru	A		
	Right	A				Right	A		
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		29.0				15.0			
Yellow		4.0				4.0			
All Red		2.0				2.0			

Cycle Length: 56.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	15	835	100	135	490	30	120	40	160	160	100	30
PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj flow	16	870	100	141	510	29	125	42	141	167	104	29
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Lane group	L	TR		L	TR			LTR			LTR	
Adj flow	16	970		141	539			308			300	
Prop LTs	1.000	0.000		1.000	0.000			0.406			0.557	
Prop RTs		0.103			0.054			0.458			0.097	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG	L	TR		L	TR			LTR			LTR	
So	1900	1900		1900	1900			1900			1900	
Lanes	1	1	0	1	1	0	0	1	0	0	1	0
fW	0.967	0.967		0.967	0.967			0.967			1.000	
fHV	1.000	0.953		1.000	0.944			0.980			0.988	
fG	1.000	1.000		1.000	1.000			1.000			1.000	
fP	1.000	1.000		1.000	1.000			1.000			1.000	
fBB	1.000	1.000		1.000	1.000			1.000			1.000	
fA	1.000	1.000		1.000	1.000			1.000			1.000	
fLU	1.000	1.000		1.000	1.000			1.000			1.000	
fRT		0.985			0.992			0.938			0.987	
fLT	0.375	1.000		0.138	1.000			0.761			0.666	
Sec.												
fLpb	1.000	1.000		1.000	1.000			1.000			1.000	
fRpb		1.000			1.000			1.000			1.000	
S	688	1723		253	1720			1285			1234	
Sec.												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left	L	16	688	0.02	0.52	356	0.04
Prot							
Perm							
Thru	TR	970	1723	# 0.56	0.52	892	1.09
Right							
Westbound							
Prot							
Perm							
Left	L	141	253	0.56	0.52	131	1.08
Prot							
Perm							
Thru	TR	539	1720	0.31	0.52	891	0.60
Right							
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	308	1285	0.24	0.27	344	0.90
Right							
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	300	1234	# 0.24	0.27	331	0.91
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.81
Total lost time per cycle, L = 12.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.03

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.04	0.52	6.7	1.000	356	0.11	0.1	0.0	6.7	A		
TR	1.09	0.52	13.5	1.000	892	0.50	56.8	0.0	70.3	E	69.2	E
Westbound												
L	1.08	0.52	13.5	1.000	131	0.50	100.5	0.0	114.0	F		
TR	0.60	0.52	9.5	1.000	891	0.19	1.2	0.0	10.7	B	32.1	C
Northbound												
LTR	0.90	0.27	19.7	1.000	344	0.42	24.6	0.0	44.3	D	44.3	D
Southbound												
LTR	0.91	0.27	19.8	1.000	331	0.43	27.3	0.0	47.1	D	47.1	D

Intersection delay = 51.8 (sec/veh) Intersection LOS = D

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 56.0 sec				
Total actual green time for LT lane group, G (s)	29.0	29.0		
Effective permitted green time for LT lane group, g(s)	29.0	29.0		
Opposing effective green time, go (s)	29.0	29.0		
Number of lanes in LT lane group, N	1	1		
Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	16	141		
Proportion of LT in LT lane group, PLT	1.000	1.000		
Proportion of LT in opposing flow, PLTo	0.00	0.00		
Adjusted opposing flow rate, Vo (veh/h)	539	970		
Lost time for LT lane group, tL	6.00	6.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	0.25	2.19		
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	8.38	15.09		
gf=G[exp(- a * (LTC ** b)]-tl, gf<=g	0.0	0.0		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.48	0.48		
gq, (see Exhibit C16-4,5,6,7,8)	5.54	25.55		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	23.46	3.45		
n=Max(gq-gf)/2,0)	2.77	12.78		
PTHo=1-PLTo	1.00	1.00		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00	1.00		
EL1 (refer to Exhibit C16-3)	2.16	3.23		
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.14	0.14		
gdiff=max(gq-gf,0)	0.00	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.37	0.14		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.375	0.138		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 56.0 sec				
Total actual green time for LT lane group, G (s)			15.0	15.0
Effective permitted green time for LT lane group, g(s)			15.0	15.0
Opposing effective green time, go (s)			15.0	15.0
Number of lanes in LT lane group, N			1	1

Number of lanes in opposing approach, No			1	1
Adjusted LT flow rate, VLT (veh/h)			125	167
Proportion of LT in LT lane group, PLT	0.000	0.000	0.406	0.557
Proportion of LT in opposing flow, PLTo			0.56	0.41
Adjusted opposing flow rate, Vo (veh/h)			300	308
Lost time for LT lane group, tL			6.00	6.00
Computation				
LT volume per cycle, LTC=VLTC/3600			1.94	2.60
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			4.67	4.79
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g			0.0	0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)			1.00	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]			0.73	0.73
gq, (see Exhibit C16-4,5,6,7,8)			5.48	5.72
gu=g-gq if gq>=gf, or = g-gf if gq<gf			9.52	9.28
n=Max(gq-gf)/2,0)			2.74	2.86
PTHo=1-PLTo			0.44	0.59
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]			0.41	0.56
EL1 (refer to Exhibit C16-3)			1.88	1.90
EL2=Max((1-Ptho**n)/Plto, 1.0)			1.60	1.91
fmin=2(1+PL)/g or fmin=2(1+Pl)/g			0.19	0.21
gdiff=max(gq-gf,0)			5.48	5.72
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)			0.76	0.67
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)], (fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT			0.761	0.666

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	56.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						
v/c ratio from Capacity Worksheet, X						
Protected phase effective green interval, g (s)						
Opposing queue effective green interval, gq						
Unopposed green interval, gu						
Red time r=(C-g-gq-gu)						
Arrival rate, qa=v/(3600(max[X,1.0]))						
Protected ph. departure rate, Sp=s/3600						
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						
XPerm						
XProt						
Case						
Queue at beginning of green arrow, Qa						
Queue at beginning of unsaturated green, Qu						
Residual queue, Qr						
Uniform Delay, d1						

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00	13.5	6.7	0.00	0.0	0.0	6.7
TR	0.0	0.00	13.5	13.5	0.00	19.5	0.0	70.3
	0.0						0.0	
Westbound								
L	0.0	0.00	13.5	13.5	0.00	2.5	0.0	114.0
TR	0.0	0.00	13.5	9.5	0.00	0.0	0.0	10.7
	0.0						0.0	
Northbound								
	0.0						0.0	
LTR	0.0	0.00	20.5	19.7	0.00	0.0	0.0	44.3
	0.0						0.0	
Southbound								
	0.0						0.0	
LTR	0.0	0.00	20.5	19.8	0.00	0.0	0.0	47.1
	0.0						0.0	

Intersection Delay 51.8 sec/veh Intersection LOS D

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	TR		L	TR			LTR			LTR	
Init Queue	0.0	0.0		0.0	0.0			0.0			0.0	
Flow Rate	16	970		141	539			308			300	
So	1900	1900		1900	1900			1900			1900	
No.Lanes	1	1	0	1	1	0	0	1	0	0	1	0
SL	688	1723		253	1720			1285			1234	
LnCapacity	356	892		131	891			344			331	
Flow Ratio	0.0	0.6		0.6	0.3			0.2			0.2	
v/c Ratio	0.04	1.09		1.08	0.60			0.90			0.91	
Grn Ratio	0.52	0.52		0.52	0.52			0.27			0.27	
I Factor		1.000			1.000			1.000			1.000	
AT or PVG	3	3		3	3			3			3	
Pltn Ratio	1.00	1.00		1.00	1.00			1.00			1.00	
PF2	1.00	1.00		1.00	1.00			1.00			1.00	
Q1	0.1	15.1		2.2	5.9			4.6			4.5	
kB	0.3	0.5		0.2	0.5			0.3			0.3	
Q2	0.0	14.0		2.4	0.7			1.7			1.8	
Q Average	0.1	29.0		4.6	6.6			6.3			6.3	
Q Spacing	24.9	24.9		24.9	24.9			24.9			24.9	
Q Storage	0	0		0	0			0			0	
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.1		1.2	1.2			1.2			1.2	
BOQ	0.2	33.4		5.4	7.8			7.5			7.5	
QSRatio												
85th Percentile Output:												
fB%	1.6	1.4		1.6	1.5			1.5			1.5	
BOQ	0.2	41.1		7.1	10.2			9.7			9.7	
QSRatio												
90th Percentile Output:												
fB%	1.8	1.5		1.7	1.7			1.7			1.7	
BOQ	0.2	43.4		7.9	11.2			10.7			10.6	
QSRatio												
95th Percentile Output:												
fB%	2.1	1.6		2.0	1.9			1.9			1.9	
BOQ	0.3	47.0		9.0	12.7			12.1			12.1	
QSRatio												
98th Percentile Output:												
fB%	2.7	1.8		2.4	2.3			2.3			2.3	
BOQ	0.4	52.5		11.0	15.2			14.6			14.6	
QSRatio												

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R67ELbuami
Date: 1/25/11
Period: AM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67

Inter.: Rt 67/East Line Rd
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build with Imp

N/S St: East Line Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	0
LGConfig	L	TR		L	TR		L	TR		L	TR	
Volume	15	835	100	135	490	30	120	40	160	160	100	30
Lane Width	11.0	11.0		11.0	11.0		12.0	11.0		12.0	12.0	
RTOR Vol			4			2			25			2

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A	A			SB	Left	A			
	Thru	A	A				Thru	A			
	Right	A	A				Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		49.0	3.0					18.0			
Yellow		4.0	4.0					4.0			
All Red		2.0	2.0					2.0			

Cycle Length: 88.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	408	732	0.04	0.56	8.9	A		
TR	959	1723	1.01	0.56	51.4	D	50.7	D
Westbound								
L	262	1745	0.54	0.66	35.2	D		
TR	1134	1720	0.48	0.66	7.8	A	13.5	B
Northbound								
L	259	1264	0.48	0.20	32.3	C		
TR	324	1582	0.56	0.20	33.8	C	33.2	C
Southbound								
L	221	1079	0.76	0.20	46.8	D		
TR	371	1812	0.36	0.20	30.6	C	39.6	D

Intersection Delay = 35.7 (sec/veh) Intersection LOS = D

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R67ELbuami
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Rt 67/East Line Rd
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build with Imp
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67 N/S St: East Line Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	15	835	100	135	490	30	120	40	160	160	100	30
% Heavy Veh	0	4	13	0	6	4	1	5	2	1	1	3
PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
PK 15 Vol	4	217	26	35	128	8	31	10	42	42	26	8
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900		1900	1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	0
LGConfig	L	TR		L	TR		L	TR		L	TR	
Lane Width	11.0	11.0		11.0	11.0		12.0	11.0		12.0	12.0	
RTOR Vol			4			2			25			2
Adj Flow	16	970		141	539		125	183		167	133	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000		1.000	0.000		1.000	0.000	
Prop RTs	0.103			0.054			0.770			0.218		
Peds Bikes	0			0			0			0		
Buses	0	0		0	0		0	0		0	0	
%InProtPhase				0.0								

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru	A		
	Right	A				Right	A		
	Peds					Peds			
WB	Left	A	A			SB Left	A		
	Thru	A	A			Thru	A		
	Right	A	A			Right	A		
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		49.0	3.0				18.0		
Yellow		4.0	4.0				4.0		
All Red		2.0	2.0				2.0		

Cycle Length: 88.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	15	835	100	135	490	30	120	40	160	160	100	30
PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj flow	16	870	100	141	510	29	125	42	141	167	104	29
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Lane group	L	TR		L	TR		L	TR		L	TR	
Adj flow	16	970		141	539		125	183		167	133	
Prop LTs	1.000	0.000		1.000	0.000		1.000	0.000		1.000	0.000	
Prop RTs	0.103			0.054			0.770			0.218		

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG	L	TR		L	TR		L	TR		L	TR	
So	1900	1900		1900	1900		1900	1900		1900	1900	
Lanes	1	1	0	1	1	0	1	1	0	1	1	0
fW	0.967	0.967		0.967	0.967		1.000	0.967		1.000	1.000	
fHV	1.000	0.953		1.000	0.944		0.990	0.974		0.990	0.986	
fG	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fP	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fBB	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fA	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fLU	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fRT		0.985			0.992			0.884			0.967	
fLT	0.399	1.000		0.950	1.000		0.672	1.000		0.573	1.000	
Sec.				0.082								
fLpb	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fRpb		1.000			1.000			1.000			1.000	
S	732	1723		1745	1720		1264	1582		1079	1812	
Sec.				150								

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left	L	16	732	0.02	0.56	408	0.04
Prot							
Perm							
Thru	TR	970	1723	# 0.56	0.56	959	1.01
Right							
Westbound							
Prot		57	1745	# 0.03	0.102	178	0.32
Perm		84	150	0.56	0.557	84	1.00
Left	L	141			0.66	262	0.54
Prot							
Perm							
Thru	TR	539	1720	0.31	0.66	1134	0.48
Right							
Northbound							
Prot							
Perm							
Left	L	125	1264	0.10	0.20	259	0.48
Prot							
Perm							
Thru	TR	183	1582	0.12	0.20	324	0.56
Right							
Southbound							
Prot							
Perm							
Left	L	167	1079	# 0.15	0.20	221	0.76
Prot							
Perm							
Thru	TR	133	1812	0.07	0.20	371	0.36
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.75
Total lost time per cycle, L = 12.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.87

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.04	0.56	8.8	1.000	408	0.11	0.0	0.0	8.9	A		
TR	1.01	0.56	19.5	1.000	959	0.50	31.9	0.0	51.4	D	50.7	D
Westbound												
L	0.54	0.66	33.0	1.000	262	0.14	2.2	0.0	35.2	D		
TR	0.48	0.66	7.4	1.000	1134	0.11	0.3	0.0	7.8	A	13.5	B
Northbound												
L	0.48	0.20	30.9	1.000	259	0.11	1.4	0.0	32.3	C		
TR	0.56	0.20	31.5	1.000	324	0.16	2.3	0.0	33.8	C	33.2	C
Southbound												
L	0.76	0.20	32.9	1.000	221	0.31	13.8	0.0	46.8	D		
TR	0.36	0.20	30.0	1.000	371	0.11	0.6	0.0	30.6	C	39.6	D

Intersection delay = 35.7 (sec/veh) Intersection LOS = D

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 88.0 sec				
Total actual green time for LT lane group, G (s)	49.0	58.0	18.0	18.0
Effective permitted green time for LT lane group, g(s)	49.0	49.0	18.0	18.0
Opposing effective green time, go (s)	58.0	49.0	18.0	18.0
Number of lanes in LT lane group, N	1	1	1	1
Number of lanes in opposing approach, No	1	1	1	1
Adjusted LT flow rate, VLT (veh/h)	16	141	125	167
Proportion of LT in LT lane group, PLT	1.000	1.000	1.000	1.000
Proportion of LT in opposing flow, PLTo	0.00	0.00	0.00	0.00
Adjusted opposing flow rate, Vo (veh/h)	539	970	133	183
Lost time for LT lane group, tL	6.00	6.00	6.00	6.00
Computation				
LT volume per cycle, LTC=VLTC/3600	0.39	3.45	3.06	4.08
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	13.18	23.71	3.25	4.47
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	0.0	0.0	0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00	1.00	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.34	0.44	0.80	0.80
gq, (see Exhibit C16-4,5,6,7,8)	6.82	39.58	0.00	1.92
gu=g-gq if gq>=gf, or = g-gf if gq<gf	42.18	9.42	18.00	16.08
n=Max(gq-gf)/2,0)	3.41	19.79	0.00	0.96
PTHo=1-PLTo	1.00	1.00	1.00	1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00	1.00	1.00	1.00
EL1 (refer to Exhibit C16-3)	2.16	3.23	1.49	1.56
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.08	0.08	0.22	0.22
gdiff=max(gq-gf,0)	0.00	0.00	0.00	0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.40	0.08	0.67	0.57
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.399	0.082	0.672	0.573

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 88.0 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				
Number of lanes in LT lane group, N				

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000 0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Cycle length, C 88.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v		141		
v/c ratio from Capacity Worksheet, X		0.54		
Protected phase effective green interval, g (s)		9.0		
Opposing queue effective green interval, gq		39.58		
Unopposed green interval, gu		9.42		
Red time r=(C-g-gq-gu)		30.0		
Arrival rate, qa=v/(3600(max[X,1.0]))		0.04		
Protected ph. departure rate, Sp=s/3600		0.485		
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)		0.22		
XPerm		1.52		
XProt				
Case		5		
Queue at beginning of green arrow, Qa		1.05		
Queue at beginning of unsaturated green, Qu		2.73		
Residual queue, Qr		0.00		
Uniform Delay, d1		33.0		

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00	19.5	8.8	0.00	0.0	0.0	8.9
TR	0.0	0.00	19.5	19.5	0.00	2.8	0.0	51.4
	0.0						0.0	
Westbound								
L	0.0	0.00		33.0	0.00	0.0	0.0	35.2
TR	0.0	0.00	15.0	7.4	0.00	0.0	0.0	7.8
	0.0						0.0	
Northbound								
L	0.0	0.00	35.0	30.9	0.00	0.0	0.0	32.3
TR	0.0	0.00	35.0	31.5	0.00	0.0	0.0	33.8
	0.0						0.0	
Southbound								
L	0.0	0.00	35.0	32.9	0.00	0.0	0.0	46.8
TR	0.0	0.00	35.0	30.0	0.00	0.0	0.0	30.6
	0.0						0.0	

Intersection Delay 35.7 sec/veh Intersection LOS D

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	TR		L	TR		L	TR		L	TR	
Init Queue	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate	16	970		141	539		125	183		167	133	
So	1900	1900		1900	1900		1900	1900		1900	1900	
No.Lanes	1	1	0	1	1	0	1	1	0	1	1	0
SL	732	1723		397	1720		1264	1582		1079	1812	
LnCapacity	408	959		262	1134		259	324		221	371	
Flow Ratio	0.0	0.6		0.4	0.3		0.1	0.1		0.2	0.1	
v/c Ratio	0.04	1.01		0.54	0.48		0.48	0.56		0.76	0.36	
Grn Ratio	0.56	0.56		0.66	0.66		0.20	0.20		0.20	0.20	
I Factor		1.000			1.000			1.000			1.000	
AT or PVG	3	3		3	3		3	3		3	3	
Pltn Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
PF2	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Q1	0.2	23.7		1.2	6.5		2.7	4.0		3.8	2.8	
kB	0.4	0.7		0.3	0.7		0.3	0.3		0.3	0.4	
Q2	0.0	9.7		0.3	0.7		0.3	0.4		0.8	0.2	
Q Average	0.2	33.4		1.6	7.2		3.0	4.5		4.6	3.0	
Q Spacing	24.9	24.9		24.9	24.9		25.0	24.9		25.0	24.9	
Q Storage	0	0		0	0		0	0		0	0	
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.1		1.2	1.2		1.2	1.2		1.2	1.2	
BOQ	0.2	38.2		1.9	8.5		3.5	5.3		5.5	3.6	
QSRatio												
85th Percentile Output:												
fB%	1.6	1.4		1.6	1.5		1.6	1.6		1.6	1.6	
BOQ	0.3	46.7		2.5	11.1		4.7	7.0		7.2	4.7	
QSRatio												
90th Percentile Output:												
fB%	1.8	1.5		1.8	1.7		1.7	1.7		1.7	1.7	
BOQ	0.3	49.3		2.8	12.1		5.2	7.7		7.9	5.2	
QSRatio												
95th Percentile Output:												
fB%	2.1	1.6		2.0	1.9		2.0	2.0		2.0	2.0	
BOQ	0.4	53.2		3.3	13.7		6.0	8.8		9.0	6.0	
QSRatio												
98th Percentile Output:												
fB%	2.7	1.8		2.6	2.3		2.5	2.4		2.4	2.5	
BOQ	0.5	59.3		4.1	16.4		7.4	10.7		11.1	7.5	
QSRatio												

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R67ELnbpm
Date: 1/25/11
Period: PM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67

Inter.: Rt 67/East Line Rd
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 No-Build

N/S St: East Line Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	25	690	115	160	865	90	130	90	125	40	55	10
Lane Width	11.0	11.0		11.0	11.0			11.0			12.0	
RTOR Vol			0			5			25			3

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		42.0						24.0			
Yellow		4.0						4.0			
All Red		2.0						2.0			

Cycle Length: 78.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	94	175	0.29	0.54	11.5	B		
TR	926	1719	0.94	0.54	32.9	C	32.3	C
Westbound								
L	116	216	1.48	0.54	275.5	F		
TR	950	1764	1.07	0.54	69.4	E	99.1	F
Northbound								
LTR	440	1430	0.78	0.31	33.7	C	33.7	C
Southbound								
LTR	452	1468	0.24	0.31	20.5	C	20.5	C

Intersection Delay = 63.4 (sec/veh) Intersection LOS = E

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
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4 Automation Lane
Albany, NY 12205

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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R67ELnbpm
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Rt 67/East Line Rd
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 No-Build
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67 N/S St: East Line Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	25	690	115	160	865	90	130	90	125	40	55	10
% Heavy Veh	0	5	2	1	3	0	2	0	1	0	0	9
PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
PK 15 Vol	7	185	31	43	233	24	35	24	34	11	15	3
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900			1900			1900	
ParkExist												
NumPark												
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Lane Width	11.0	11.0		11.0	11.0			11.0			12.0	
RTOR Vol			0			5			25			3
Adj Flow	27	866		172	1021			345			110	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000			0.406			0.391	
Prop RTs		0.143			0.089		0.313			0.073		
Peds Bikes		0			0		0			0		
Buses	0	0		0	0			0			0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru	A		
	Right	A				Right	A		
	Peds					Peds			
WB	Left	A				SB Left	A		
	Thru	A				Thru	A		
	Right	A				Right	A		
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		42.0					24.0		
Yellow		4.0					4.0		
All Red		2.0					2.0		

Cycle Length: 78.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	25	690	115	160	865	90	130	90	125	40	55	10
PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj flow	27	742	124	172	930	91	140	97	108	43	59	8
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Lane group	L	TR		L	TR		LTR			LTR		
Adj flow	27	866		172	1021		345			110		
Prop LTs	1.000	0.000		1.000	0.000		0.406			0.391		
Prop RTs	0.143			0.089			0.313			0.073		

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG	L	TR		L	TR		LTR			LTR		
So	1900	1900		1900	1900		1900			1900		
Lanes	1	1	0	1	1	0	0	1	0	0	1	0
fW	0.967	0.967		0.967	0.967			0.967			1.000	
fHV	1.000	0.956		0.990	0.973			0.989			0.993	
fG	1.000	1.000		1.000	1.000			1.000			1.000	
fP	1.000	1.000		1.000	1.000			1.000			1.000	
fBB	1.000	1.000		1.000	1.000			1.000			1.000	
fA	1.000	1.000		1.000	1.000			1.000			1.000	
fLU	1.000	1.000		1.000	1.000			1.000			1.000	
fRT		0.979			0.987			0.958			0.990	
fLT	0.095	1.000		0.119	1.000			0.822			0.785	
Sec.												
fLpb	1.000	1.000		1.000	1.000			1.000			1.000	
fRpb		1.000			1.000			1.000			1.000	
S	175	1719		216	1764			1430			1468	
Sec.												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left	L	27	175	0.15	0.54	94	0.29
Prot							
Perm							
Thru	TR	866	1719	0.50	0.54	926	0.94
Right							
Westbound							
Prot							
Perm							
Left	L	172	216	# 0.80	0.54	116	1.48
Prot							
Perm							
Thru	TR	1021	1764	0.58	0.54	950	1.07
Right							
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	345	1430	# 0.24	0.31	440	0.78
Right							
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	110	1468	0.07	0.31	452	0.24
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 1.04
Total lost time per cycle, L = 12.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.23

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.29	0.54	9.8	1.000	94	0.11	1.7	0.0	11.5	B		
TR	0.94	0.54	16.7	1.000	926	0.45	16.2	0.0	32.9	C	32.3	C
Westbound												
L	1.48	0.54	18.0	1.000	116	0.50	257.5	0.0	275.5	F		
TR	1.07	0.54	18.0	1.000	950	0.50	51.4	0.0	69.4	E	99.1	F
Northbound												
LTR	0.78	0.31	24.6	1.000	440	0.33	9.0	0.0	33.7	C	33.7	C
Southbound												
LTR	0.24	0.31	20.2	1.000	452	0.11	0.3	0.0	20.5	C	20.5	C

Intersection delay = 63.4 (sec/veh) Intersection LOS = E

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 78.0 sec				
Total actual green time for LT lane group, G (s)	42.0	42.0		
Effective permitted green time for LT lane group, g(s)	42.0	42.0		
Opposing effective green time, go (s)	42.0	42.0		
Number of lanes in LT lane group, N	1	1		
Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	27	172		
Proportion of LT in LT lane group, PLT	1.000	1.000		
Proportion of LT in opposing flow, PLTo	0.00	0.00		
Adjusted opposing flow rate, Vo (veh/h)	1021	866		
Lost time for LT lane group, tL	6.00	6.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	0.59	3.73		
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	22.12	18.76		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	0.0		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.46	0.46		
gq, (see Exhibit C16-4,5,6,7,8)	41.18	27.38		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	0.82	14.62		
n=Max(gq-gf)/2,0)	20.59	13.69		
PTHo=1-PLTo	1.00	1.00		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00	1.00		
EL1 (refer to Exhibit C16-3)	3.39	2.93		
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.10	0.10		
gdiff=max(gq-gf,0)	0.00	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.10	0.12		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.095	0.119		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 78.0 sec				
Total actual green time for LT lane group, G (s)			24.0	24.0
Effective permitted green time for LT lane group, g(s)			24.0	24.0
Opposing effective green time, go (s)			24.0	24.0
Number of lanes in LT lane group, N			1	1

Number of lanes in opposing approach, No			1	1
Adjusted LT flow rate, VLT (veh/h)			140	43
Proportion of LT in LT lane group, PLT	0.000	0.000	0.406	0.391
Proportion of LT in opposing flow, PLTo			0.39	0.41
Adjusted opposing flow rate, Vo (veh/h)			110	345
Lost time for LT lane group, tL			6.00	6.00
Computation				
LT volume per cycle, LTC=VLTC/3600			3.03	0.93
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			2.38	7.47
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g			0.0	4.5
Opposing platoon ratio, Rpo (refer Exhibit 16-11)			1.00	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]			0.69	0.69
gq, (see Exhibit C16-4,5,6,7,8)			0.49	9.50
gu=g-gq if gq>=gf, or = g-gf if gq<gf			23.51	14.50
n=Max(gq-gf)/2,0)			0.24	2.48
PTHo=1-PLTo			0.61	0.59
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]			0.41	0.39
EL1 (refer to Exhibit C16-3)			1.55	1.97
EL2=Max((1-Ptho**n)/Plto, 1.0)			1.00	1.79
fmin=2(1+PL)/g or fmin=2(1+Pl)/g			0.12	0.12
gdiff=max(gq-gf,0)			0.49	4.95
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)			0.82	0.79
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT			0.822	0.785

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	78.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						
v/c ratio from Capacity Worksheet, X						
Protected phase effective green interval, g (s)						
Opposing queue effective green interval, gq						
Unopposed green interval, gu						
Red time r=(C-g-gq-gu)						
Arrival rate, qa=v/(3600(max[X,1.0]))						
Protected ph. departure rate, Sp=s/3600						
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						
XPerm						
XProt						
Case						
Queue at beginning of green arrow, Qa						
Queue at beginning of unsaturated green, Qu						
Residual queue, Qr						
Uniform Delay, d1						

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00	18.0	9.8	0.00	0.0	0.0	11.5
TR	0.0	0.00	18.0	16.7	0.00	0.0	0.0	32.9
	0.0						0.0	
Westbound								
L	0.0	0.00	18.0	18.0	0.00	14.0	0.0	275.5
TR	0.0	0.00	18.0	18.0	0.00	17.7	0.0	69.4
	0.0						0.0	
Northbound								
	0.0						0.0	
LTR	0.0	0.00	27.0	24.6	0.00	0.0	0.0	33.7
	0.0						0.0	
Southbound								
	0.0						0.0	
LTR	0.0	0.00	27.0	20.2	0.00	0.0	0.0	20.5
	0.0						0.0	

Intersection Delay 63.4 sec/veh Intersection LOS E

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	TR		L	TR			LTR			LTR	
Init Queue	0.0	0.0		0.0	0.0			0.0			0.0	
Flow Rate	27	866		172	1021			345			110	
So	1900	1900		1900	1900			1900			1900	
No.Lanes	1	1	0	1	1	0	0	1	0	0	1	0
SL	175	1719		216	1764			1430			1468	
LnCapacity	94	926		116	950			440			452	
Flow Ratio	0.2	0.5		0.8	0.6			0.2			0.1	
v/c Ratio	0.29	0.94		1.48	1.07			0.78			0.24	
Grn Ratio	0.54	0.54		0.54	0.54			0.31			0.31	
I Factor		1.000			1.000			1.000			1.000	
AT or PVG	3	3		3	3			3			3	
Pltn Ratio	1.00	1.00		1.00	1.00			1.00			1.00	
PF2	1.00	1.00		1.00	1.00			1.00			1.00	
Q1	0.3	17.4		3.7	22.1			6.8			1.8	
kB	0.2	0.6		0.2	0.6			0.4			0.4	
Q2	0.1	5.2		7.5	14.3			1.3			0.1	
Q Average	0.4	22.6		11.2	36.5			8.1			1.9	
Q Spacing	24.9	24.9		24.9	24.9			24.9			24.9	
Q Storage	0	0		0	0			0			0	
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2		1.2	1.1			1.2			1.2	
BOQ	0.5	26.2		13.2	41.6			9.6			2.3	
QSRatio												
85th Percentile Output:												
fB%	1.6	1.4		1.5	1.4			1.5			1.6	
BOQ	0.6	32.6		16.9	50.6			12.4			3.0	
QSRatio												
90th Percentile Output:												
fB%	1.8	1.5		1.6	1.5			1.7			1.8	
BOQ	0.7	34.6		18.3	53.4			13.5			3.4	
QSRatio												
95th Percentile Output:												
fB%	2.1	1.7		1.8	1.6			1.9			2.0	
BOQ	0.8	37.8		20.4	57.6			15.2			3.9	
QSRatio												
98th Percentile Output:												
fB%	2.7	1.9		2.1	1.8			2.2			2.6	
BOQ	1.0	42.4		23.8	64.2			18.1			4.9	
QSRatio												

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R67ELbupm
Date: 1/25/11
Period: PM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67

Inter.: Rt 67/East Line Rd
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build

N/S St: East Line Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	25	710	115	160	955	90	130	90	125	40	55	10
Lane Width	11.0	11.0		11.0	11.0			11.0			12.0	
RTOR Vol			0			5			25			3

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		42.0						24.0			
Yellow		4.0						4.0			
All Red		2.0						2.0			

Cycle Length: 78.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	94	175	0.29	0.54	11.5	B		
TR	926	1719	0.96	0.54	37.2	D	36.5	D
Westbound								
L	102	189	1.69	0.54	365.4	F		
TR	951	1766	1.18	0.54	108.1	F	142.4	F
Northbound								
LTR	440	1430	0.78	0.31	33.7	C	33.7	C
Southbound								
LTR	452	1468	0.24	0.31	20.5	C	20.5	C

Intersection Delay = 86.8 (sec/veh) Intersection LOS = F

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R67ELbupm
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Rt 67/East Line Rd
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67 N/S St: East Line Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	25	710	115	160	955	90	130	90	125	40	55	10
% Heavy Veh	0	5	2	1	3	0	2	0	1	0	0	9
PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
PK 15 Vol	7	191	31	43	257	24	35	24	34	11	15	3
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900			1900			1900	
ParkExist												
NumPark												
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Lane Width	11.0	11.0		11.0	11.0			11.0			12.0	
RTOR Vol			0			5			25			3
Adj Flow	27	887		172	1118			345			110	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000			0.406			0.391	
Prop RTs		0.140			0.081			0.313			0.073	
Peds Bikes		0			0			0			0	
Buses	0	0		0	0			0			0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		42.0						24.0			
Yellow		4.0						4.0			
All Red		2.0						2.0			

Cycle Length: 78.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	25	710	115	160	955	90	130	90	125	40	55	10
PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj flow	27	763	124	172	1027	91	140	97	108	43	59	8
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Lane group	L	TR		L	TR		LTR			LTR		
Adj flow	27	887		172	1118		345			110		
Prop LTs	1.000	0.000		1.000	0.000		0.406			0.391		
Prop RTs	0.140			0.081			0.313			0.073		

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG	L	TR		L	TR		LTR			LTR		
So	1900	1900		1900	1900		1900			1900		
Lanes	1	1	0	1	1	0	0	1	0	0	1	0
fW	0.967	0.967		0.967	0.967			0.967			1.000	
fHV	1.000	0.956		0.990	0.973			0.989			0.993	
fG	1.000	1.000		1.000	1.000			1.000			1.000	
fP	1.000	1.000		1.000	1.000			1.000			1.000	
fBB	1.000	1.000		1.000	1.000			1.000			1.000	
fA	1.000	1.000		1.000	1.000			1.000			1.000	
fLU	1.000	1.000		1.000	1.000			1.000			1.000	
fRT		0.979			0.988			0.958			0.990	
fLT	0.095	1.000		0.104	1.000			0.822			0.785	
Sec.												
fLpb	1.000	1.000		1.000	1.000			1.000			1.000	
fRpb		1.000			1.000			1.000			1.000	
S	175	1719		189	1766			1430			1468	
Sec.												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left	L	27	175	0.15	0.54	94	0.29
Prot							
Perm							
Thru	TR	887	1719	0.52	0.54	926	0.96
Right							
Westbound							
Prot							
Perm							
Left	L	172	189	# 0.91	0.54	102	1.69
Prot							
Perm							
Thru	TR	1118	1766	0.63	0.54	951	1.18
Right							
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	345	1430	# 0.24	0.31	440	0.78
Right							
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	110	1468	0.07	0.31	452	0.24
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 1.15
Total lost time per cycle, L = 12.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.36

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.29	0.54	9.8	1.000	94	0.11	1.7	0.0	11.5	B		
TR	0.96	0.54	17.2	1.000	926	0.47	20.1	0.0	37.2	D	36.5	D
Westbound												
L	1.69	0.54	18.0	1.000	102	0.50	347.4	0.0	365.4	F		
TR	1.18	0.54	18.0	1.000	951	0.50	90.1	0.0	108.1	F	142.4	F
Northbound												
LTR	0.78	0.31	24.6	1.000	440	0.33	9.0	0.0	33.7	C	33.7	C
Southbound												
LTR	0.24	0.31	20.2	1.000	452	0.11	0.3	0.0	20.5	C	20.5	C

Intersection delay = 86.8 (sec/veh) Intersection LOS = F

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 78.0 sec				
Total actual green time for LT lane group, G (s)	42.0	42.0		
Effective permitted green time for LT lane group, g(s)	42.0	42.0		
Opposing effective green time, go (s)	42.0	42.0		
Number of lanes in LT lane group, N	1	1		
Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	27	172		
Proportion of LT in LT lane group, PLT	1.000	1.000		
Proportion of LT in opposing flow, PLTo	0.00	0.00		
Adjusted opposing flow rate, Vo (veh/h)	1118	887		
Lost time for LT lane group, tL	6.00	6.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	0.59	3.73		
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	24.22	19.22		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	0.0		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.46	0.46		
gq, (see Exhibit C16-4,5,6,7,8)	42.00	28.97		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	0.00	13.03		
n=Max(gq-gf)/2,0)	21.00	14.49		
PTHo=1-PLTo	1.00	1.00		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00	1.00		
EL1 (refer to Exhibit C16-3)	3.71	2.99		
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.10	0.10		
gdiff=max(gq-gf,0)	0.00	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.10	0.10		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.095	0.104		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 78.0 sec				
Total actual green time for LT lane group, G (s)			24.0	24.0
Effective permitted green time for LT lane group, g(s)			24.0	24.0
Opposing effective green time, go (s)			24.0	24.0
Number of lanes in LT lane group, N			1	1

Number of lanes in opposing approach, No			1	1
Adjusted LT flow rate, VLT (veh/h)			140	43
Proportion of LT in LT lane group, PLT	0.000	0.000	0.406	0.391
Proportion of LT in opposing flow, PLTo			0.39	0.41
Adjusted opposing flow rate, Vo (veh/h)			110	345
Lost time for LT lane group, tL			6.00	6.00
Computation				
LT volume per cycle, LTC=VLTC/3600			3.03	0.93
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			2.38	7.47
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g			0.0	4.5
Opposing platoon ratio, Rpo (refer Exhibit 16-11)			1.00	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]			0.69	0.69
gq, (see Exhibit C16-4,5,6,7,8)			0.49	9.50
gu=g-gq if gq>=gf, or = g-gf if gq<gf			23.51	14.50
n=Max(gq-gf)/2,0)			0.24	2.48
PTHo=1-PLTo			0.61	0.59
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]			0.41	0.39
EL1 (refer to Exhibit C16-3)			1.55	1.97
EL2=Max((1-Ptho**n)/Plto, 1.0)			1.00	1.79
fmin=2(1+PL)/g or fmin=2(1+Pl)/g			0.12	0.12
gdiff=max(gq-gf,0)			0.49	4.95
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)			0.82	0.79
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT			0.822	0.785

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	78.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v						
v/c ratio from Capacity Worksheet, X						
Protected phase effective green interval, g (s)						
Opposing queue effective green interval, gq						
Unopposed green interval, gu						
Red time r=(C-g-gq-gu)						
Arrival rate, qa=v/(3600(max[X,1.0]))						
Protected ph. departure rate, Sp=s/3600						
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)						
XPerm						
XProt						
Case						
Queue at beginning of green arrow, Qa						
Queue at beginning of unsaturated green, Qu						
Residual queue, Qr						
Uniform Delay, d1						

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00	18.0	9.8	0.00	0.0	0.0	11.5
TR	0.0	0.00	18.0	17.2	0.00	0.0	0.0	37.2
	0.0						0.0	
Westbound								
L	0.0	0.00	18.0	18.0	0.00	17.5	0.0	365.4
TR	0.0	0.00	18.0	18.0	0.00	41.7	0.0	108.1
	0.0						0.0	
Northbound								
	0.0						0.0	
LTR	0.0	0.00	27.0	24.6	0.00	0.0	0.0	33.7
	0.0						0.0	
Southbound								
	0.0						0.0	
LTR	0.0	0.00	27.0	20.2	0.00	0.0	0.0	20.5
	0.0						0.0	

Intersection Delay 86.8 sec/veh Intersection LOS F

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	TR		L	TR			LTR			LTR	
Init Queue	0.0	0.0		0.0	0.0			0.0			0.0	
Flow Rate	27	887		172	1118			345			110	
So	1900	1900		1900	1900			1900			1900	
No.Lanes	1	1	0	1	1	0	0	1	0	0	1	0
SL	175	1719		189	1766			1430			1468	
LnCapacity	94	926		102	951			440			452	
Flow Ratio	0.2	0.5		0.9	0.6			0.2			0.1	
v/c Ratio	0.29	0.96		1.69	1.18			0.78			0.24	
Grn Ratio	0.54	0.54		0.54	0.54			0.31			0.31	
I Factor		1.000			1.000			1.000			1.000	
AT or PVG	3	3		3	3			3			3	
Pltn Ratio	1.00	1.00		1.00	1.00			1.00			1.00	
PF2	1.00	1.00		1.00	1.00			1.00			1.00	
Q1	0.3	18.3		3.7	24.2			6.8			1.8	
kB	0.2	0.6		0.2	0.6			0.4			0.4	
Q2	0.1	6.1		9.1	24.4			1.3			0.1	
Q Average	0.4	24.4		12.9	48.6			8.1			1.9	
Q Spacing	24.9	24.9		24.9	24.9			24.9			24.9	
Q Storage	0	0		0	0			0			0	
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2		1.2	1.1			1.2			1.2	
BOQ	0.5	28.2		15.1	54.9			9.6			2.3	
QSRatio												
85th Percentile Output:												
fB%	1.6	1.4		1.5	1.4			1.5			1.6	
BOQ	0.6	35.0		19.2	66.1			12.4			3.0	
QSRatio												
90th Percentile Output:												
fB%	1.8	1.5		1.6	1.4			1.7			1.8	
BOQ	0.7	37.1		20.7	69.8			13.5			3.4	
QSRatio												
95th Percentile Output:												
fB%	2.1	1.7		1.8	1.5			1.9			2.0	
BOQ	0.8	40.4		23.1	74.9			15.2			3.9	
QSRatio												
98th Percentile Output:												
fB%	2.7	1.9		2.1	1.7			2.2			2.6	
BOQ	1.0	45.2		26.6	83.8			18.1			4.9	
QSRatio												

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, R67ELbupmi
Date: 1/25/11
Period: PM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67

Inter.: Rt 67/East Line Rd
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build with Imp

N/S St: East Line Road

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	0
LGConfig	L	TR		L	TR		L	TR		L	TR	
Volume	25	710	115	160	955	90	130	90	125	40	55	10
Lane Width	11.0	11.0		11.0	11.0		12.0	11.0		12.0	12.0	
RTOR Vol			0			5			25			3

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A	A			SB	Left	A			
	Thru	A	A				Thru	A			
	Right	A	A				Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		49.0	3.0					18.0			
Yellow		4.0	4.0					4.0			
All Red		2.0	2.0					2.0			

Cycle Length: 88.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	84	150	0.32	0.56	12.7	B		
TR	957	1719	0.93	0.56	32.5	C	31.9	C
Westbound								
L	296	1728	0.58	0.66	32.7	C		
TR	1164	1766	0.96	0.66	31.6	C	31.8	C
Northbound								
L	272	1329	0.51	0.20	32.8	C		
TR	344	1683	0.60	0.20	34.5	C	33.8	C
Southbound								
L	204	997	0.21	0.20	29.6	C		
TR	378	1846	0.18	0.20	29.1	C	29.3	C

Intersection Delay = 32.0 (sec/veh) Intersection LOS = C

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, R67ELbupmi
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Rt 67/East Line Rd
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build with Imp
Project ID: 110-255, GF Malta TIS
E/W St: Rt 67 N/S St: East Line Road

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	25	710	115	160	955	90	130	90	125	40	55	10
% Heavy Veh	0	5	2	1	3	0	2	0	1	0	0	9
PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
PK 15 Vol	7	191	31	43	257	24	35	24	34	11	15	3
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900		1900	1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	0
LGConfig	L	TR		L	TR		L	TR		L	TR	
Lane Width	11.0	11.0		11.0	11.0		12.0	11.0		12.0	12.0	
RTOR Vol			0			5			25			3
Adj Flow	27	887		172	1118		140	205		43	67	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000		1.000	0.000		1.000	0.000	
Prop RTs		0.140			0.081			0.527			0.119	
Peds Bikes		0			0			0			0	
Buses	0	0		0	0		0	0		0	0	
%InProtPhase				0.0								

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A				NB Left	A		
	Thru	A				Thru	A		
	Right	A				Right	A		
	Peds					Peds			
WB	Left	A	A			SB Left	A		
	Thru	A	A			Thru	A		
	Right	A	A			Right	A		
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		49.0	3.0				18.0		
Yellow		4.0	4.0				4.0		
All Red		2.0	2.0				2.0		

Cycle Length: 88.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	25	710	115	160	955	90	130	90	125	40	55	10
PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj flow	27	763	124	172	1027	91	140	97	108	43	59	8
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Lane group	L	TR		L	TR		L	TR		L	TR	
Adj flow	27	887		172	1118		140	205		43	67	
Prop LTs	1.000	0.000		1.000	0.000		1.000	0.000		1.000	0.000	
Prop RTs	0.140			0.081			0.527			0.119		

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound			Westbound			Northbound			Southbound		
LG	L	TR		L	TR		L	TR		L	TR	
So	1900	1900		1900	1900		1900	1900		1900	1900	
Lanes	1	1	0	1	1	0	1	1	0	1	1	0
fW	0.967	0.967		0.967	0.967		1.000	0.967		1.000	1.000	
fHV	1.000	0.956		0.990	0.973		0.980	0.995		1.000	0.989	
fG	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fP	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fBB	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fA	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fLU	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fRT		0.979			0.988			0.921			0.982	
fLT	0.082	1.000		0.950	1.000		0.713	1.000		0.525	1.000	
Sec.				0.117								
fLpb	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
fRpb		1.000			1.000			1.000			1.000	
S	150	1719		1728	1766		1329	1683		997	1846	
Sec.				213								

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left	L	27	150	0.18	0.56	84	0.32
Prot							
Perm							
Thru	TR	887	1719	0.52	0.56	957	0.93
Right							
Westbound							
Prot		53	1728	0.03	0.102	177	0.30
Perm		119	213	0.56	0.557	119	1.00
Left	L	172			0.66	296	0.58
Prot							
Perm							
Thru	TR	1118	1766	# 0.63	0.66	1164	0.96
Right							
Northbound							
Prot							
Perm							
Left	L	140	1329	0.11	0.20	272	0.51
Prot							
Perm							
Thru	TR	205	1683	# 0.12	0.20	344	0.60
Right							
Southbound							
Prot							
Perm							
Left	L	43	997	0.04	0.20	204	0.21
Prot							
Perm							
Thru	TR	67	1846	0.04	0.20	378	0.18
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.75
Total lost time per cycle, L = 12.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.87

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.32	0.56	10.5	1.000	84	0.11	2.2	0.0	12.7	B		
TR	0.93	0.56	17.9	1.000	957	0.44	14.6	0.0	32.5	C	31.9	C
Westbound												
L	0.58	0.66	29.8	1.000	296	0.17	2.9	0.0	32.7	C		
TR	0.96	0.66	13.9	1.000	1164	0.47	17.7	0.0	31.6	C	31.8	C
Northbound												
L	0.51	0.20	31.1	1.000	272	0.12	1.7	0.0	32.8	C		
TR	0.60	0.20	31.7	1.000	344	0.18	2.8	0.0	34.5	C	33.8	C
Southbound												
L	0.21	0.20	29.1	1.000	204	0.11	0.5	0.0	29.6	C		
TR	0.18	0.20	28.9	1.000	378	0.11	0.2	0.0	29.1	C	29.3	C

Intersection delay = 32.0 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 88.0 sec				
Total actual green time for LT lane group, G (s)	49.0	58.0	18.0	18.0
Effective permitted green time for LT lane group, g(s)	49.0	49.0	18.0	18.0
Opposing effective green time, go (s)	58.0	49.0	18.0	18.0
Number of lanes in LT lane group, N	1	1	1	1
Number of lanes in opposing approach, No	1	1	1	1
Adjusted LT flow rate, VLT (veh/h)	27	172	140	43
Proportion of LT in LT lane group, PLT	1.000	1.000	1.000	1.000
Proportion of LT in opposing flow, PLTo	0.00	0.00	0.00	0.00
Adjusted opposing flow rate, Vo (veh/h)	1118	887	67	205
Lost time for LT lane group, tL	6.00	6.00	6.00	6.00
Computation				
LT volume per cycle, LTC=VLTC/3600	0.66	4.20	3.42	1.05
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	27.33	21.68	1.64	5.01
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	0.0	0.0	0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00	1.00	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.34	0.44	0.80	0.80
gq, (see Exhibit C16-4,5,6,7,8)	43.18	31.89	0.00	3.00
gu=g-gq if gq>=gf, or = g-gf if gq<gf	5.82	17.11	18.00	15.00
n=Max(gq-gf)/2,0)	21.59	15.94	0.00	1.50
PTHo=1-PLTo	1.00	1.00	1.00	1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00	1.00	1.00	1.00
EL1 (refer to Exhibit C16-3)	3.71	2.99	1.40	1.59
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.08	0.08	0.22	0.22
gdiff=max(gq-gf,0)	0.00	0.00	0.00	0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.08	0.12	0.71	0.52
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.082	0.117	0.713	0.525

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 88.0 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				
Number of lanes in LT lane group, N				

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000 0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	88.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v			172		
v/c ratio from Capacity Worksheet, X			0.58		
Protected phase effective green interval, g (s)			9.0		
Opposing queue effective green interval, gq			31.89		
Unopposed green interval, gu			17.11		
Red time r=(C-g-gq-gu)			30.0		
Arrival rate, qa=v/(3600(max[X,1.0]))			0.05		
Protected ph. departure rate, Sp=s/3600			0.480		
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)			0.17		
XPerm			1.30		
XProt					
Case			5		
Queue at beginning of green arrow, Qa			0.88		
Queue at beginning of unsaturated green, Qu			2.96		
Residual queue, Qr			0.00		
Uniform Delay, d1			29.8		

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00	19.5	10.5	0.00	0.0	0.0	12.7
TR	0.0	0.00	19.5	17.9	0.00	0.0	0.0	32.5
	0.0						0.0	
Westbound								
L	0.0	0.00		29.8	0.00	0.0	0.0	32.7
TR	0.0	0.00	15.0	13.9	0.00	0.0	0.0	31.6
	0.0						0.0	
Northbound								
L	0.0	0.00	35.0	31.1	0.00	0.0	0.0	32.8
TR	0.0	0.00	35.0	31.7	0.00	0.0	0.0	34.5
	0.0						0.0	
Southbound								
L	0.0	0.00	35.0	29.1	0.00	0.0	0.0	29.6
TR	0.0	0.00	35.0	28.9	0.00	0.0	0.0	29.1
	0.0						0.0	

Intersection Delay 32.0 sec/veh Intersection LOS C

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	TR		L	TR		L	TR		L	TR	
Init Queue	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate	27	887		172	1118		140	205		43	67	
So	1900	1900		1900	1900		1900	1900		1900	1900	
No.Lanes	1	1	0	1	1	0	1	1	0	1	1	0
SL	150	1719		448	1766		1329	1683		997	1846	
LnCapacity	84	957		296	1164		272	344		204	378	
Flow Ratio	0.2	0.5		0.4	0.6		0.1	0.1		0.0	0.0	
v/c Ratio	0.32	0.93		0.58	0.96		0.51	0.60		0.21	0.18	
Grn Ratio	0.56	0.56		0.66	0.66		0.20	0.20		0.20	0.20	
I Factor		1.000			1.000			1.000			1.000	
AT or PVG	3	3		3	3		3	3		3	3	
Pltn Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
PF2	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Q1	0.4	19.9		1.5	25.4		3.0	4.5		0.9	1.4	
kB	0.2	0.7		0.3	0.7		0.3	0.4		0.3	0.4	
Q2	0.1	5.3		0.4	7.7		0.3	0.5		0.1	0.1	
Q Average	0.4	25.1		2.0	33.1		3.4	5.1		0.9	1.4	
Q Spacing	24.9	24.9		24.9	24.9		25.0	24.9		25.0	24.9	
Q Storage	0	0		0	0		0	0		0	0	
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2		1.2	1.1		1.2	1.2		1.2	1.2	
BOQ	0.5	29.0		2.3	37.9		4.0	6.0		1.1	1.7	
QSRatio												
85th Percentile Output:												
fB%	1.6	1.4		1.6	1.4		1.6	1.6		1.6	1.6	
BOQ	0.7	35.9		3.1	46.3		5.3	7.9		1.5	2.3	
QSRatio												
90th Percentile Output:												
fB%	1.8	1.5		1.8	1.5		1.7	1.7		1.8	1.8	
BOQ	0.8	38.0		3.5	48.9		5.9	8.6		1.7	2.5	
QSRatio												
95th Percentile Output:												
fB%	2.1	1.6		2.0	1.6		2.0	2.0		2.1	2.1	
BOQ	0.9	41.4		4.0	52.8		6.7	9.9		2.0	2.9	
QSRatio												
98th Percentile Output:												
fB%	2.7	1.8		2.6	1.8		2.5	2.4		2.6	2.6	
BOQ	1.1	46.3		5.0	58.9		8.3	12.0		2.5	3.7	
QSRatio												

ERROR MESSAGES

No errors to report.

DETAILED OUTPUT

Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Route 9/Route 67/Dunning Street
No-Build 2022
AM Peak Hour
Roundabout

OUTPUT TABLE LINKS

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Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

```
Intersection ID: 1
Roundabout

-------------------------------------------------------------------------------
                                                Circulating/Exiting Stream
 Cent  Circ  Insc  Ent Ent Cir Ent Av.Ent ------------------------------------
Island Width Diam. Rad Ang Lan Lan Lane   Flow %HV Adjust. %Exit  Cap.    O-D
 Diam                               Width            Flow   Incl. Constr. Factor
  ft    ft    ft   ft  deg          ft   veh/h      pcu/h        Effect
-------------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
```

```
 105    33   171  100  30   2   2  13.00  729  2.2   745     0     N     0.858
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  752  3.7   780     0     N     0.896
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  985  0.8   993     0     N     0.805
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  753  2.5   772     0     N     0.854
-----------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

Go to Table Links (Top)

Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
Turn Lane    Lane    ---- Circulating/Exiting Stream ---   Critical Gap
      No.    Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                      Rate  Speed   Dist Headway Bunched   Hdwy    Dist  Headway
                     pcu/h   mph     ft    sec              sec     ft     sec
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  745   20.3   144.1  1.27   0.439    3.88   115.8    2.65
Thru  1 Subdominant  745   20.3   144.1  1.27   0.439    3.88   115.9    2.65
      2 Dominant     745   20.3   144.1  1.27   0.439    3.75   112.0    2.56
Right 2 Dominant     745   20.3   144.1  1.27   0.439    3.75   112.0    2.56
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  780   19.7   133.3  1.43   0.496    5.12   147.8    3.51
Thru  2 Dominant     780   19.7   133.3  1.43   0.496    3.61   104.2    2.47
Right 2 Dominant     780   19.7   133.3  1.43   0.496    3.68   106.2    2.52
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  993   21.1   112.3  1.50   0.609    3.59   111.3    2.54
Thru  1 Subdominant  993   21.1   112.3  1.50   0.609    3.74   115.8    2.64
      2 Dominant     993   21.1   112.3  1.50   0.609    3.52   109.1    2.49
Right 2 Dominant     993   21.1   112.3  1.50   0.609    3.42   106.0    2.42
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  772   21.1   144.5  1.49   0.509    4.76   147.7    3.26
Thru  2 Dominant     772   21.1   144.5  1.49   0.509    3.65   113.2    2.50
Right 2 Dominant     772   21.1   144.5  1.49   0.509    3.69   114.3    2.53
-----------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

Go to Table Links (Top)

Roundabout Pedestrian Effects
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

```
Intersection ID: 1
```

Roundabout

ROUNDABOUT ENTRY

Turn	Pedestrian Flow Rate	Circulating Flow Rate	Adjustment Factor
South: Route 9 NB			
Left	1	745	1.000
Thru	1	745	1.000
Right	1	745	1.000
East: Dunning Street WB			
Left	1	780	1.000
Thru	1	780	1.000
Right	1	780	1.000
North: Route 9 SB			
Left	1	993	1.000
Thru	1	993	1.000
Right	1	993	1.000
West: Route 67 EB			
Left	2	772	0.999
Thru	2	772	0.999
Right	2	772	0.999

ROUNDABOUT EXIT

Pedestrian Flow Rate (ped/h)	Conflict Zone Length (ft)	Critical Gap (sec)	Follow-up Headway (sec)	Exit Lane Capacity (veh/h)	Total Exit Flow (veh/h)	Average Exit Flow (veh/h/lane)

Go to Table Links (Top)

Movements

Movement Capacity Parameters
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Movement Flow veh/h	HV %	Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	205	3.0	729	2.2	745	476	0.85	98	100	0.430
8T T	297	3.0	729	2.2	745	690	0.85	98	100	0.430
8R R	105	3.0	729	2.2	745	244	0.85	98	100	0.430
East: Dunning Street WB										
1L L	193	1.0	752	3.7	780	452	0.85	99	100	0.427
6T T	552	0.0	752	3.7	780	650	0.85	0	100	0.850*
6R R	93	2.0	752	3.7	780	109	0.85	0	100	0.850*
North: Route 9 SB										
7L L	135	0.0	985	0.8	993	178	0.85	12	100	0.756
4T T	424	4.0	985	0.8	993	561	0.85	12	100	0.756
4R R	297	1.0	985	0.8	993	392	0.85	12	100	0.756
West: Route 67 EB										
5L L	250	5.2	753	2.5	772	483	0.85	64	100	0.518

2T	T	343	1.0	753	2.5	772	406	0.85	1	100	0.845
2R	R	256	2.0	753	2.5	772	303	0.85	1	100	0.845

* Maximum degree of saturation

Go to Table Links (Top)

Movement Performance
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID		Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB										
3L	L	0.64	0.77	11.3	0.96	195.6	4.82	72.6	3.5	20.8
8T	T	0.90	1.08	11.0	0.81	239.1	6.36	95.1	4.3	22.3
8R	R	0.31	0.38	10.8	0.86	90.0	2.26	33.4	1.5	22.3
East: Dunning Street WB										
1L	L	0.85	1.02	15.9	0.95	183.3	5.21	73.9	3.8	19.7
6T	T	4.54	5.45	29.6	1.29	711.6	18.57	192.9	11.3	17.1
6R	R	0.77	0.92	29.6	1.29	120.5	3.13	32.3	1.9	17.1
North: Route 9 SB										
7L	L	1.06	1.27	28.3	1.23	165.4	3.88	29.3	2.3	12.8
4T	T	3.25	3.90	27.5	1.18	501.4	11.47	77.9	6.2	12.7
4R	R	2.16	2.59	26.2	1.20	354.9	7.85	53.9	4.2	12.9
West: Route 67 EB										
5L	L	1.23	1.48	17.8	1.00	250.0	6.50	78.7	4.4	17.7
2T	T	2.90	3.49	30.5	1.29	442.8	10.93	95.4	6.3	15.1
2R	R	2.17	2.60	30.5	1.29	331.1	8.15	70.7	4.7	15.1

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Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID		Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB							
3L	L	50.30	3.6	33.9	2.29	0.056	0.068
8T	T	61.58	4.5	42.9	2.88	0.070	0.087
8R	R	22.11	1.6	15.4	1.06	0.025	0.032
		133.99	9.7	92.3	6.23	0.151	0.186
East: Dunning Street WB							
1L	L	51.94	3.5	33.1	2.14	0.056	0.063
6T	T	153.15	9.9	93.9	6.26	0.167	0.181
6R	R	26.51	1.8	16.7	1.12	0.029	0.033
		231.61	15.2	143.7	9.52	0.253	0.277
North: Route 9 SB							
7L	L	31.12	1.9	18.2	1.34	0.034	0.036
4T	T	85.62	5.9	55.6	4.45	0.100	0.122
4R	R	57.76	3.8	35.9	2.85	0.067	0.077
		174.51	11.6	109.7	8.65	0.202	0.235

West: Route 67 EB						
5L L	63.35	4.5	42.4	2.97	0.071	0.086
2T T	85.77	5.6	53.0	3.77	0.096	0.106
2R R	65.22	4.3	40.7	2.91	0.073	0.082
	214.34	14.4	136.1	9.65	0.239	0.275
INTERSECTION:	754.44	50.9	481.8	34.05	0.844	0.973

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.43	20.3	290.6	19.59	0.480	0.580
8T T	0.40	21.0	280.4	18.81	0.455	0.567
8R R	0.41	20.5	287.4	19.80	0.471	0.590
	0.41	20.6	285.2	19.26	0.467	0.575
East: Dunning Street WB						
1L L	0.44	21.1	278.3	17.95	0.474	0.533
6T T	0.49	19.4	302.6	20.16	0.539	0.584
6R R	0.51	18.4	320.6	21.59	0.559	0.629
	0.48	19.7	298.6	19.77	0.525	0.576
North: Route 9 SB						
7L L	0.66	15.2	386.4	28.37	0.728	0.765
4T T	0.68	13.3	443.4	35.54	0.799	0.973
4R R	0.67	14.2	413.8	32.90	0.774	0.882
	0.67	13.9	423.1	33.35	0.778	0.905
West: Route 67 EB						
5L L	0.50	17.6	335.2	23.49	0.558	0.681
2T T	0.56	17.0	345.0	24.56	0.622	0.691
2R R	0.57	16.5	357.2	25.54	0.639	0.722
	0.54	17.0	345.4	24.50	0.606	0.697
INTERSECTION:	0.52	17.8	330.4	23.35	0.579	0.667

Go to Table Links (Top)

Intersection Negotiation Data
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?
South: Route 9 NB								
	South	Left	65.7	16.3	361.2	1450	406	No
	East	Right	123.3	20.7	66.2	1450	210	No
	North	Thru	200.1	24.9	161.6	1450	266	No

	West	Left	65.7	16.3	258.0	1450	406	No
East: Dunning Street WB								
	South	Left	65.7	16.3	258.0	1600	423	No
	East	Left	65.7	16.3	361.2	1600	423	No
	North	Right	123.3	20.7	66.2	1600	199	No
	West	Thru	200.1	24.9	161.6	1600	251	No
North: Route 9 SB								
	South	Thru	200.1	24.9	161.6	725	283	No
	East	Left	65.7	16.3	258.0	725	374	No
	North	Left	65.7	16.3	361.2	725	374	No
	West	Right	123.3	20.7	66.2	725	223	No
West: Route 67 EB								
	South	Right	123.3	20.7	66.2	1225	213	No
	East	Thru	200.1	24.9	161.6	1225	267	No
	North	Left	65.7	16.3	258.0	1225	442	No
	West	Left	65.7	16.3	361.2	1225	442	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

Go to Table Links (Top)

Movement Speeds and Geometric Delay
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	30.0	16.3	16.3	30.0	11.5		23.9	20.8	8.2
8T T	30.0	24.9	24.9	30.0	11.6		25.0	22.3	1.8
8R R	30.0	20.7	20.7	30.0	11.6		25.3	22.3	3.2
East: Dunning Street WB									
1L L	30.0	16.3	16.3	30.0	10.1		23.6	19.7	8.2
6T T	30.0	24.9	24.9	30.0	11.6		23.0	17.1	1.7
6R R	30.0	20.7	20.7	30.0	11.6		23.3	17.1	3.1
North: Route 9 SB									
7L L	30.0	16.3	16.3	30.0	10.9		20.3	12.8	8.2
4T T	30.0	24.9	24.9	30.0	10.8		19.4	12.7	1.8
4R R	30.0	20.7	20.7	30.0	11.1		19.7	12.9	3.1
West: Route 67 EB									
5L L	30.0	16.3	16.3	30.0	10.7		22.1	17.7	8.5
2T T	30.0	24.9	24.9	30.0	11.7		21.6	15.1	1.7
2R R	30.0	20.7	20.7	30.0	11.7		21.9	15.1	3.1

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

Go to Table Links (Top)

Lanes

Lane Performance

Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 95% Back veh	Queue 95% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	296	688	0.430	11.3	0.91	2.4	62.1	2500.0
2 TR	310	722	0.430	10.8	0.83	2.5	62.9	2500.0
East: Dunning Street WB								
1 L	193	452	0.427	15.9	0.95	2.2	54.9	350.0
2 TR	645	759	0.850	29.6	1.29	10.6	264.9	1600.0
North: Route 9 SB								
1 LT	407	539	0.756	28.3	1.20	6.9	176.3	725.0
2 TR	449	593	0.756	26.2	1.19	7.2	183.6	725.0
West: Route 67 EB								
1 L	250	483	0.518	17.8	1.00	3.1	81.3	1225.0
2 TR	599	709	0.845	30.5	1.29	10.4	262.1	1225.0

Go to Table Links (Top)

Lane Flow and Capacity Information
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	205	91	0	296	150	688	0.430	100
2 TR	0	206	105	310	150	722	0.430	100
East: Dunning Street WB								
1 L	193	0	0	193	150	452	0.427	100
2 TR	0	552	93	645	150	759	0.850	100
North: Route 9 SB								
1 LT	135	272	0	407	150	539	0.756	100
2 TR	0	152	297	449	150	593	0.756	100
West: Route 67 EB								
1 L	250	0	0	250	150	483	0.518	100
2 TR	0	343	256	599	150	709	0.845	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

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Lane, Approach and Intersection Performance
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane	Demand Flow (veh/h)	Adj.	Eff Grn	Deg	Aver.	Longest	Shrt

No.	L	T	R	Tot	%HV	Basic Satf.	(sec) 1st	(sec) 2nd	Sat x	Delay sec	Queue ft	Lane ft
South: Route 9 NB												
1 LT	205	91		296	3				0.430	11.3	62	2500
2 TR		206	105	310	3				0.430	10.8	63	2500
	205	297	105	606	3				0.430	11.0	63	
East: Dunning Street WB												
1 L	193			193	1				0.427	15.9	55	350
2 TR		552	93	645	0				0.850	29.6	265	1600
	193	552	93	838	0				0.850	26.5	265	
North: Route 9 SB												
1 LT	135	272		407	3				0.756	28.3	176	725
2 TR		152	297	449	2				0.756	26.2	184	725
	135	424	297	856	2				0.756	27.2	184	
West: Route 67 EB												
1 L	250			250	5				0.518	17.8	81	1225
2 TR		343	256	599	1				0.845	30.5	262	1225
	250	343	256	849	3				0.845	26.7	262	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	3149	2	0.850	23.8	265

Peak flow period = 15 minutes.

Queue values in this table are 95% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Go to Table Links (Top)

Driver Characteristics
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec
South: Route 9 NB						
1 LT	19.0	1359	2.65	73.65	25.60	1.73
2 TR	23.5	1405	2.56	88.22	25.60	1.82
East: Dunning Street WB						
1 L	16.3	1025	3.51	84.05	25.20	2.46
2 TR	24.3	1450	2.48	88.38	25.06	1.78
North: Route 9 SB						
1 LT	22.0	1380	2.61	84.37	25.54	1.82
2 TR	22.1	1473	2.44	79.30	25.40	1.66
West: Route 67 EB						
1 L	16.3	1103	3.26	78.13	26.03	2.18
2 TR	23.1	1432	2.51	85.15	25.29	1.77

Saturation Flow and Saturation Headway are derived from follow-up headway.

Go to Table Links (Top)

Lane Delays

Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
		Delay (seconds/veh)								
South: Route 9 NB										
1 LT	0.430	7.4	3.9	11.3	0.0	7.8	0.4	7.4	6.3	11.3
2 TR	0.430	7.1	3.7	10.8	0.0	6.1	0.4	5.8	2.2	10.8
East: Dunning Street WB										
1 L	0.427	10.1	5.8	15.9	0.0	12.2	0.7	11.6	8.2	15.9
2 TR	0.850	9.0	20.6	29.6	0.0	23.3	4.3	19.0	1.9	29.6
North: Route 9 SB										
1 LT	0.756	10.5	17.8	28.3	0.0	23.2	3.1	20.0	3.9	28.3
2 TR	0.756	9.8	16.4	26.2	0.0	20.4	3.1	17.2	2.7	26.2
West: Route 67 EB										
1 L	0.518	10.0	7.7	17.8	0.0	13.8	1.1	12.8	8.5	17.8
2 TR	0.845	9.3	21.2	30.5	0.0	24.3	4.1	20.2	2.3	30.5

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

Geometric delay is less than 2 seconds for some movements. The negotiation speed may be too high or the approach and exit speeds may be too low for given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds, negotiation radius or negotiation speed data in the Path Data dialog.

Go to Table Links (Top)

Lane Queues (Vehicles)
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (veh) Nb1	Nb2	Nb	95%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	95%
South: Route 9 NB											
1 LT	0.430	0.1	0.9	0.1	1.0	2.4	0.02	0.0	100.0	0.9	1.7
2 TR	0.430	0.1	0.9	0.1	1.0	2.5	0.03	0.0	100.0	0.9	1.7
East: Dunning Street WB											
1 L	0.427	0.1	0.8	0.1	0.9	2.2	0.16	0.0	100.0	0.9	1.5
2 TR	0.850	1.4	2.5	1.8	4.3	10.6	0.17	0.0	100.0	5.3	9.6
North: Route 9 SB											
1 LT	0.756	0.8	1.9	0.8	2.8	6.9	0.24	0.0	100.0	3.2	5.8
2 TR	0.756	0.8	2.0	0.9	2.9	7.2	0.25	0.0	100.0	3.3	5.9
West: Route 67 EB											
1 L	0.518	0.2	1.1	0.2	1.3	3.1	0.07	0.0	100.0	1.2	2.2

2 TR	0.845	1.3	2.5	1.6	4.2	10.4	0.21	0.0	100.0	5.1	9.2

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queues (Distance)
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	95%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	95%
South: Route 9 NB											
1 LT	0.430	1.6	23.4	1.6	25.0	62.1	0.02	0.0	100.0	23.7	42.9
2 TR	0.430	1.5	23.8	1.5	25.3	62.9	0.03	0.0	100.0	23.9	43.3
East: Dunning Street WB											
1 L	0.427	2.2	20.1	2.0	22.1	54.9	0.16	0.0	100.0	21.5	39.0
2 TR	0.850	33.8	62.2	44.4	106.6	264.9	0.17	0.0	100.0	133.0	241.3
North: Route 9 SB											
1 LT	0.756	19.6	49.7	21.3	71.0	176.3	0.24	0.0	100.0	81.7	148.2
2 TR	0.756	20.1	51.5	22.4	73.9	183.6	0.25	0.0	100.0	83.0	150.5
West: Route 67 EB											
1 L	0.518	4.4	28.4	4.3	32.7	81.3	0.07	0.0	100.0	32.1	58.3
2 TR	0.845	32.4	63.8	41.6	105.5	262.1	0.21	0.0	100.0	128.2	232.6

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (veh) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.430	1.0	1.3	1.8	2.1	2.4	2.7
2 TR	0.430	1.0	1.3	1.8	2.1	2.5	2.7
East: Dunning Street WB							
1 L	0.427	0.9	1.1	1.6	1.9	2.2	2.4
2 TR	0.850	4.3	5.5	7.8	9.0	10.6	11.7
North: Route 9 SB							
1 LT	0.756	2.8	3.6	5.1	5.9	6.9	7.7
2 TR	0.756	2.9	3.8	5.3	6.1	7.2	8.0
West: Route 67 EB							
1 L	0.518	1.3	1.6	2.3	2.7	3.1	3.5

2 TR	0.845	4.2	5.4	7.6	8.8	10.4	11.5

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Distance)
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.430	25.0	32.4	45.6	52.8	62.1	69.0
2 TR	0.430	25.3	32.8	46.2	53.5	62.9	69.8
East: Dunning Street WB							
1 L	0.427	22.1	28.6	40.3	46.7	54.9	60.9
2 TR	0.850	106.5	138.0	194.6	225.3	264.9	294.0
North: Route 9 SB							
1 LT	0.756	70.9	91.9	129.5	149.9	176.3	195.7
2 TR	0.756	73.8	95.6	134.8	156.1	183.6	203.8
West: Route 67 EB							
1 L	0.518	32.7	42.3	59.7	69.1	81.3	90.2
2 TR	0.845	105.4	136.5	192.5	222.9	262.1	290.9

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Stops
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.430	0.73	0.03	0.15	0.91	268.7	0.07	20.4	0.73
2 TR	0.430	0.73	0.03	0.07	0.83	256.0	0.06	19.8	0.73
East: Dunning Street WB									
1 L	0.427	0.73	0.05	0.17	0.95	183.3	0.12	24.1	0.73
2 TR	0.850	0.96	0.32	0.01	1.29	832.1	0.71	459.3	0.96
North: Route 9 SB									
1 LT	0.756	0.94	0.23	0.03	1.20	486.7	0.54	220.7	0.94
2 TR	0.756	0.95	0.23	0.02	1.19	535.1	0.53	237.8	0.95
West: Route 67 EB									
1 L	0.518	0.79	0.08	0.13	1.00	250.0	0.18	46.0	0.79
2 TR	0.845	0.98	0.31	0.01	1.29	773.8	0.68	404.8	0.98

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale Fixed	Flow Scale Var	Peak Flow Factor
South: Route 9 NB								
	South	3L	Left	1	0	1.00	1.00	0.86
	East	8R	Right	102	3	1.00	1.00	0.86
	North	8T	Thru	288	9	1.00	1.00	0.86
	West	3L	Left	197	6	1.00	1.00	0.86
East: Dunning Street WB								
	South	1L	Left	190	2	1.00	1.00	0.86
	East	1L	Left	1	0	1.00	1.00	0.86
	North	6R	Right	91	2	1.00	1.00	0.86
	West	6T	Thru	552	0	1.00	1.00	0.86
North: Route 9 SB								
	South	4T	Thru	407	17	1.00	1.00	0.86
	East	7L	Left	134	0	1.00	1.00	0.86
	North	7L	Left	1	0	1.00	1.00	0.86
	West	4R	Right	294	3	1.00	1.00	0.86
West: Route 67 EB								
	South	2R	Right	251	5	1.00	1.00	0.86
	East	2T	Thru	340	3	1.00	1.00	0.86
	North	5L	Left	202	13	1.00	1.00	0.86
	West	5L	Left	35	0	1.00	1.00	0.86

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

Go to Table Links (Top)

Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	199	6	0	0	0	0
8T T	0	0	288	9	0	0
8R R	0	0	0	0	102	3
East: Dunning Street WB						
1L L	191	2	0	0	0	0
6T T	0	0	552	0	0	0
6R R	0	0	0	0	91	2
North: Route 9 SB						
7L L	135	0	0	0	0	0
4T T	0	0	407	17	0	0

```
   4R R       0      0      0      0    294      3
-----------------------------------------------
West: Route 67 EB
   5L L     237     13      0      0      0      0
   2T T       0      0    340      3      0      0
   2R R       0      0      0      0    251      5
-----------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

```
Intersection ID: 1
Roundabout

-------------------------------------------------
  Mov          Left         Through        Right
  ID        ----------    ----------    ----------
            Total  %HV    Total  %HV    Total  %HV
-------------------------------------------------
Demand flows in veh/h as used by the program
South: Route 9 NB
   3L L      205   3.0       0   0.0       0   0.0
   8T T        0   0.0     297   3.0       0   0.0
   8R R        0   0.0       0   0.0     105   3.0
-------------------------------------------------
East: Dunning Street WB
   1L L      193   1.0       0   0.0       0   0.0
   6T T        0   0.0     552   0.0       0   0.0
   6R R        0   0.0       0   0.0      93   2.0
-------------------------------------------------
North: Route 9 SB
   7L L      135   0.0       0   0.0       0   0.0
   4T T        0   0.0     424   4.0       0   0.0
   4R R        0   0.0       0   0.0     297   1.0
-------------------------------------------------
West: Route 67 EB
   5L L      250   5.2       0   0.0       0   0.0
   2T T        0   0.0     343   1.0       0   0.0
   2R R        0   0.0       0   0.0     256   2.0
-------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

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Other

Model Settings
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (Customary)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  HCM Delay Model option used
  HCM Queue Model option used
```

```
Level of Service based on: Delay (HCM 2000)
Queue percentile: 95%
```

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Parameters Used in Cost Calculations
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

```
Intersection ID: 1
Roundabout


  Pump price of fuel ($/US gal)              =     2.400
  Fuel resource cost factor                  =      0.70
  Ratio of running cost to fuel cost         =       3.0
  Average income ($/h)                       =     19.00
  Time value factor                          =      0.40
  Light vehicle mass (1000 lb)               =       3.1
  Heavy vehicle mass (1000 lb)               =      24.0
  Light vehicle idle fuel rate (US gal/h)    =     0.360
  Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

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Diagnostics
Site:Route 9/Route 67/Dunning Street - AM Peak - No-Build 2022

```
Geometric delay is less than 2 seconds for some movements.  The negotiation
speed may be too high or the approach and exit speeds may be too low for
given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds,
negotiation radius or negotiation speed data in the Path Data dialog.
```

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DETAILED OUTPUT

Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Route 9/Route 67/Dunning Street
Build 2022
AM Peak Hour
Roundabout

OUTPUT TABLE LINKS

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Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

```
Intersection ID: 1
Roundabout

-------------------------------------------------------------------------------
                                                Circulating/Exiting Stream
 Cent  Circ  Insc  Ent Ent Cir Ent Av.Ent ------------------------------------
Island Width Diam. Rad Ang Lan Lan Lane   Flow %HV Adjust. %Exit  Cap.    O-D
 Diam                               Width            Flow   Incl. Constr. Factor
  ft    ft    ft   ft  deg          ft   veh/h      pcu/h        Effect
-------------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
```

```
 105    33   171  100  30   2   2  13.00  707  2.3   723     0     Y     0.859
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  781  3.7   810     0     N     0.887
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00 1002  0.8  1011     0     N     0.798
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  899  2.7   923     0     N     0.796
-----------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

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Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
Turn Lane   Lane   ---- Circulating/Exiting Stream ---   Critical Gap
     No.    Type    Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                    Rate  Speed   Dist Headway Bunched   Hdwy    Dist  Headway
                   pcu/h  mph     ft    sec              sec     ft     sec
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  723   20.1   146.5  1.32   0.442    3.90   114.8    2.65
Thru  1 Subdominant  723   20.1   146.5  1.32   0.442    3.90   114.8    2.65
      2 Dominant     723   20.1   146.5  1.32   0.442    3.78   111.2    2.57
Right 2 Dominant     723   20.1   146.5  1.32   0.442    3.78   111.2    2.57
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  810   19.8   128.8  1.41   0.506    5.08   147.3    3.50
Thru  2 Dominant     810   19.8   128.8  1.41   0.506    3.57   103.6    2.46
Right 2 Dominant     810   19.8   128.8  1.41   0.506    3.65   105.6    2.51
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant 1011   21.1   110.2  1.51   0.618    3.58   110.7    2.54
Thru  1 Subdominant 1011   21.1   110.2  1.51   0.618    3.72   115.1    2.64
      2 Dominant    1011   21.1   110.2  1.51   0.618    3.50   108.4    2.48
Right 2 Dominant    1011   21.1   110.2  1.51   0.618    3.40   105.3    2.41
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  923   21.6   123.7  1.41   0.555    4.94   156.8    3.46
Thru  2 Dominant     923   21.6   123.7  1.41   0.555    3.49   110.8    2.45
Right 2 Dominant     923   21.6   123.7  1.41   0.555    3.52   111.8    2.47
-----------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

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Roundabout Pedestrian Effects
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

```
Intersection ID: 1
```

Roundabout

ROUNDABOUT ENTRY

Turn	Pedestrian Flow Rate	Circulating Flow Rate	Adjustment Factor
South: Route 9 NB			
Left	1	723	1.000
Thru	1	723	1.000
Right	1	723	1.000
East: Dunning Street WB			
Left	1	810	1.000
Thru	1	810	1.000
Right	1	810	1.000
North: Route 9 SB			
Left	1	1011	1.000
Thru	1	1011	1.000
Right	1	1011	1.000
West: Route 67 EB			
Left	2	923	1.000
Thru	2	923	1.000
Right	2	923	1.000

ROUNDABOUT EXIT

Pedestrian Flow Rate (ped/h)	Conflict Zone Length (ft)	Critical Gap (sec)	Follow-up Headway (sec)	Exit Lane Capacity (veh/h)	Total Exit Flow (veh/h)	Average Exit Flow (veh/h/lane)

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Movements

Movement Capacity Parameters
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Movement Flow veh/h	HV %	Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	216	3.0	707	2.3	723	484	0.85	90	100	0.447
8T T	314	3.0	707	2.3	723	702	0.85	90	100	0.447
8R R	105	3.0	707	2.3	723	234	0.85	90	100	0.447
East: Dunning Street WB										
1L L	193	1.0	781	3.7	810	439	0.85	93	100	0.439
6T T	558	0.0	781	3.7	810	637	0.85	-3	100	0.876
6R R	93	2.0	781	3.7	810	106	0.85	-3	100	0.876
North: Route 9 SB										
7L L	147	0.0	1002	0.8	1011	162	0.85	-6	100	0.906
4T T	558	4.0	1002	0.8	1011	616	0.85	-6	100	0.906
4R R	297	1.0	1002	0.8	1011	327	0.85	-6	100	0.906
West: Route 67 EB										
5L L	250	5.2	899	2.7	923	368	0.85	25	100	0.680

2T	T	384	1.0	899	2.7	923	309	0.85	-31	100	1.240*
2R	R	390	2.0	899	2.7	923	314	0.85	-31	100	1.240*

* Maximum degree of saturation

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Movement Performance
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID		Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB										
3L	L	0.69	0.83	11.5	0.96	208.1	5.14	76.7	3.7	20.7
8T	T	0.98	1.18	11.3	0.82	256.9	6.81	100.7	4.5	22.1
8R	R	0.32	0.39	11.1	0.87	91.1	2.29	33.4	1.5	22.2
East: Dunning Street WB										
1L	L	0.89	1.07	16.7	0.96	185.2	5.30	73.9	3.8	19.5
6T	T	5.14	6.17	33.2	1.36	760.3	19.89	194.9	11.9	16.3
6R	R	0.86	1.03	33.2	1.36	126.9	3.31	32.3	2.0	16.3
North: Route 9 SB										
7L	L	1.92	2.30	47.1	1.50	220.1	5.69	31.8	3.2	9.8
4T	T	7.12	8.54	45.9	1.50	836.2	20.75	102.4	10.9	9.4
4R	R	3.64	4.37	44.2	1.51	447.0	10.81	53.9	5.6	9.6
West: Route 67 EB										
5L	L	2.20	2.64	31.6	1.11	277.2	8.19	78.7	5.4	14.5
2T	T	15.26	18.31	143.2	3.63	1394.8	38.71	106.7	19.1	5.6
2R	R	15.49	18.59	143.2	3.63	1412.3	39.25	107.7	19.3	5.6

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Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID		Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB							
3L	L	53.37	3.8	36.0	2.43	0.059	0.072
8T	T	65.55	4.8	45.6	3.07	0.074	0.092
8R	R	22.22	1.6	15.5	1.07	0.025	0.032
		141.14	10.2	97.1	6.57	0.159	0.196
East: Dunning Street WB							
1L	L	52.41	3.5	33.3	2.14	0.057	0.064
6T	T	161.24	10.3	97.5	6.48	0.175	0.187
6R	R	27.59	1.8	17.1	1.15	0.030	0.033
		241.23	15.6	147.9	9.77	0.262	0.284
North: Route 9 SB							
7L	L	42.59	2.4	23.0	1.60	0.045	0.043
4T	T	146.12	9.1	86.2	6.58	0.161	0.179
4R	R	74.94	4.5	42.4	3.18	0.082	0.085
		263.65	16.0	151.5	11.35	0.288	0.306

West: Route 67 EB						
5L L	74.28	4.9	46.3	3.11	0.079	0.090
2T T	236.64	11.9	112.3	6.96	0.229	0.187
2R R	242.63	12.3	116.4	7.27	0.235	0.197
	553.55	29.0	275.0	17.35	0.544	0.474
INTERSECTION:	1199.57	70.9	671.5	45.03	1.253	1.260

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Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.43	20.2	291.4	19.66	0.482	0.581
8T T	0.40	20.9	281.6	18.94	0.458	0.570
8R R	0.41	20.4	288.5	19.91	0.473	0.592
	0.42	20.6	286.3	19.36	0.469	0.578
East: Dunning Street WB						
1L L	0.44	21.0	279.7	18.02	0.477	0.535
6T T	0.51	18.9	310.8	20.66	0.558	0.596
6R R	0.53	17.9	328.7	22.06	0.577	0.640
	0.50	19.3	305.1	20.16	0.540	0.586
North: Route 9 SB						
7L L	0.83	13.1	448.5	31.14	0.873	0.837
4T T	0.89	11.3	523.1	39.90	0.979	1.085
4R R	0.86	12.1	488.1	36.66	0.946	0.976
	0.87	11.8	500.4	37.49	0.951	1.012
West: Route 67 EB						
5L L	0.59	16.1	365.9	24.59	0.627	0.713
2T T	1.38	9.0	653.6	40.53	1.334	1.089
2R R	1.40	8.8	671.4	41.93	1.358	1.134
	1.17	10.1	582.9	36.77	1.153	1.005
INTERSECTION:	0.75	14.0	420.1	28.17	0.784	0.788

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Intersection Negotiation Data
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?
South: Route 9 NB								
	South	Left	65.7	16.3	361.2	1450	406	No
	East	Right	123.3	20.7	66.2	1450	210	No
	North	Thru	200.1	24.9	161.6	1450	265	No

	West	Left	65.7	16.3	258.0	1450	406	No
East: Dunning Street WB								
	South	Left	65.7	16.3	258.0	1600	423	No
	East	Left	65.7	16.3	361.2	1600	423	No
	North	Right	123.3	20.7	66.2	1600	199	No
	West	Thru	200.1	24.9	161.6	1600	251	No
North: Route 9 SB								
	South	Thru	200.1	24.9	161.6	725	279	No
	East	Left	65.7	16.3	258.0	725	372	No
	North	Left	65.7	16.3	361.2	725	372	No
	West	Right	123.3	20.7	66.2	725	218	No
West: Route 67 EB								
	South	Right	123.3	20.7	66.2	1225	217	No
	East	Thru	200.1	24.9	161.6	1225	271	No
	North	Left	65.7	16.3	258.0	1225	442	No
	West	Left	65.7	16.3	361.2	1225	442	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

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Movement Speeds and Geometric Delay
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	30.0	16.3	16.3	30.0	11.6		23.9	20.7	8.2
8T T	30.0	24.9	24.9	30.0	11.7		24.9	22.1	1.8
8R R	30.0	20.7	20.7	30.0	11.8		25.2	22.2	3.2
East: Dunning Street WB									
1L L	30.0	16.3	16.3	30.0	10.0		23.5	19.5	8.2
6T T	30.0	24.9	24.9	30.0	11.5		22.7	16.3	1.7
6R R	30.0	20.7	20.7	30.0	11.4		23.0	16.3	3.1
North: Route 9 SB									
7L L	30.0	16.3	16.3	30.0	10.9		18.6	9.8	8.2
4T T	30.0	24.9	24.9	30.0	10.8		17.3	9.4	1.8
4R R	30.0	20.7	20.7	30.0	11.1		17.7	9.6	3.1
West: Route 67 EB									
5L L	30.0	16.3	16.3	30.0	9.9		21.5	14.5	8.5
2T T	30.0	24.9	24.9	30.0	11.2		12.9	5.6	1.7
2R R	30.0	20.7	20.7	30.0	11.1		13.0	5.6	3.1

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

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Lanes

Lane Performance

Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 95% Back veh	Queue 95% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	310	694	0.447	11.5	0.92	2.6	67.1	2500.0
2 TR	325	726	0.447	11.1	0.84	2.7	67.9	2500.0
East: Dunning Street WB								
1 L	193	439	0.439	16.7	0.96	2.3	57.0	350.0
2 TR	651	743	0.876	33.2	1.36	11.7	292.6	1600.0
North: Route 9 SB								
1 LT	477	526	0.906	47.1	1.50	12.0	307.5	725.0
2 TR	525	579	0.906	44.2	1.51	12.7	323.6	725.0
West: Route 67 EB								
1 L	250	368	0.680	31.6	1.11	4.5	118.4	1225.0
2 TR	773	624	1.240	143.2	3.63	60.8	1538.6	1225.0

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Lane Flow and Capacity Information
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	216	94	0	310	150	694	0.447	100
2 TR	0	220	105	325	150	726	0.447	100
East: Dunning Street WB								
1 L	193	0	0	193	150	439	0.439	100
2 TR	0	558	93	651	150	743	0.876	100
North: Route 9 SB								
1 LT	147	330	0	477	150	526	0.906	100
2 TR	0	228	297	525	150	579	0.906	100
West: Route 67 EB								
1 L	250	0	0	250	150	368	0.680	100
2 TR	0	384	390	773	150	624	1.240	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

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Lane, Approach and Intersection Performance
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane	Demand Flow (veh/h)	Adj.	Eff Grn	Deg	Aver.	Longest	Shrt

No.	L	T	R	Tot	%HV	Basic Satf.	(sec) 1st	(sec) 2nd	Sat x	Delay sec	Queue ft	Lane ft
South: Route 9 NB												
1 LT	216	94		310	3				0.447	11.5	67	2500
2 TR		220	105	325	3				0.447	11.1	68	2500
	216	314	105	635	3				0.447	11.3	68	
East: Dunning Street WB												
1 L	193			193	1				0.439	16.7	57	350
2 TR		558	93	651	0				0.876	33.2	293	1600
	193	558	93	844	0				0.876	29.4	293	
North: Route 9 SB												
1 LT	147	330		477	3				0.906	47.1	308	725
2 TR		228	297	525	2				0.906	44.2	324	725
	147	558	297	1001	3				0.906	45.6	324	
West: Route 67 EB												
1 L	250			250	5				0.680	31.6	118	1225
2 TR		384	390	773	2				1.240	143.2	1539	1225
	250	384	390	1023	2				1.240	115.9	1539	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	3503	2	1.240	56.0	1539

Peak flow period = 15 minutes.

Queue values in this table are 95% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

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Driver Characteristics
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec
South: Route 9 NB						
1 LT	18.9	1357	2.65	73.60	25.60	1.73
2 TR	23.5	1400	2.57	88.75	25.60	1.83
East: Dunning Street WB						
1 L	16.3	1027	3.50	83.87	25.20	2.45
2 TR	24.3	1457	2.47	88.00	25.06	1.77
North: Route 9 SB						
1 LT	22.2	1380	2.61	85.09	25.55	1.82
2 TR	22.5	1473	2.44	80.73	25.46	1.67
West: Route 67 EB						
1 L	16.3	1040	3.46	82.88	26.03	2.38
2 TR	22.8	1465	2.46	82.12	25.30	1.70

Saturation Flow and Saturation Headway are derived from follow-up headway.

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Lane Delays

Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
South: Route 9 NB										
1 LT	0.447	7.4	4.1	11.5	0.0	8.0	0.5	7.6	6.3	11.5
2 TR	0.447	7.2	3.9	11.1	0.0	6.4	0.4	5.9	2.2	11.1
East: Dunning Street WB										
1 L	0.439	10.4	6.3	16.7	0.0	12.9	0.8	12.2	8.2	16.7
2 TR	0.876	9.2	23.9	33.2	0.0	26.7	5.1	21.7	1.9	33.2
North: Route 9 SB										
1 LT	0.906	11.4	35.7	47.1	0.0	41.6	6.7	34.8	3.7	47.1
2 TR	0.906	10.7	33.4	44.2	0.0	37.9	6.8	31.1	2.5	44.2
West: Route 67 EB										
1 L	0.680	13.2	18.4	31.6	0.0	27.3	2.2	25.1	8.5	31.6
2 TR	1.240	10.8	132.4	143.2	0.0	136.8	35.2	101.6	2.4	143.2

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

Geometric delay is less than 2 seconds for some movements. The negotiation speed may be too high or the approach and exit speeds may be too low for given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds, negotiation radius or negotiation speed data in the Path Data dialog.

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Lane Queues (Vehicles)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (veh) Nbl	Nb2	Nb	95%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	95%
South: Route 9 NB											
1 LT	0.447	0.1	1.0	0.1	1.1	2.6	0.03	0.0	100.0	1.0	1.8
2 TR	0.447	0.1	1.0	0.1	1.1	2.7	0.03	0.0	100.0	1.0	1.8
East: Dunning Street WB											
1 L	0.439	0.1	0.8	0.1	0.9	2.3	0.16	0.0	100.0	0.9	1.6
2 TR	0.876	1.6	2.6	2.1	4.7	11.7	0.18	0.0	100.0	6.0	10.9
North: Route 9 SB											
1 LT	0.906	2.1	2.5	2.3	4.8	12.0	0.42	0.0	100.0	6.2	11.3
2 TR	0.906	2.2	2.6	2.5	5.1	12.7	0.45	0.0	100.0	6.4	11.7
West: Route 67 EB											
1 L	0.680	0.4	1.4	0.4	1.8	4.5	0.10	0.0	100.0	2.2	4.0

2 TR	1.240	20.1	3.9	20.6	24.5	60.8	1.26	12.2	87.8	30.8	55.8

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queues (Distance)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	95%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	95%
South: Route 9 NB											
1 LT	0.447	1.9	25.1	1.9	27.0	67.1	0.03	0.0	100.0	25.5	46.2
2 TR	0.447	1.8	25.5	1.9	27.3	67.9	0.03	0.0	100.0	25.7	46.6
East: Dunning Street WB											
1 L	0.439	2.5	20.7	2.2	22.9	57.0	0.16	0.0	100.0	22.5	40.8
2 TR	0.876	41.0	64.6	53.1	117.8	292.6	0.18	0.0	100.0	150.3	272.6
North: Route 9 SB											
1 LT	0.906	53.2	64.0	59.7	123.7	307.5	0.42	0.0	100.0	159.3	289.0
2 TR	0.906	55.4	66.6	63.5	130.2	323.6	0.45	0.0	100.0	163.9	297.4
West: Route 67 EB											
1 L	0.680	10.8	37.4	10.3	47.6	118.4	0.10	0.0	100.0	57.2	103.8
2 TR	1.240	508.6	97.5	521.6	619.1	1538.6	1.26	12.2	87.8	778.0	1411.4

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (veh) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.447	1.1	1.4	1.9	2.2	2.6	2.9
2 TR	0.447	1.1	1.4	1.9	2.3	2.7	2.9
East: Dunning Street WB							
1 L	0.439	0.9	1.2	1.7	1.9	2.3	2.5
2 TR	0.876	4.7	6.1	8.6	9.9	11.7	13.0
North: Route 9 SB							
1 LT	0.906	4.8	6.3	8.8	10.2	12.0	13.4
2 TR	0.906	5.1	6.6	9.3	10.8	12.7	14.1
West: Route 67 EB							
1 L	0.680	1.8	2.4	3.3	3.9	4.5	5.0

2 TR	1.240	24.5	31.7	44.7	51.7	60.8	67.5

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queue Percentiles (Distance)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.447	27.0	35.0	49.3	57.1	67.1	74.5
2 TR	0.447	27.3	35.4	49.9	57.8	67.9	75.4
East: Dunning Street WB							
1 L	0.439	22.9	29.7	41.8	48.4	57.0	63.2
2 TR	0.876	117.7	152.5	214.9	248.9	292.6	324.8
North: Route 9 SB							
1 LT	0.906	123.7	160.2	225.8	261.5	307.5	341.3
2 TR	0.906	130.1	168.6	237.6	275.2	323.6	359.2
West: Route 67 EB							
1 L	0.680	47.6	61.7	87.0	100.7	118.4	131.4
2 TR	1.240	618.7	801.5	1129.9	1308.3	1538.6	1707.7

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Stops
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.447	0.74	0.04	0.15	0.92	284.8	0.08	24.1	0.74
2 TR	0.447	0.74	0.03	0.07	0.84	271.3	0.07	23.6	0.74
East: Dunning Street WB									
1 L	0.439	0.74	0.06	0.16	0.96	185.2	0.14	27.0	0.74
2 TR	0.876	0.98	0.38	0.01	1.36	887.2	0.85	550.8	0.98
North: Route 9 SB									
1 LT	0.906	1.00	0.50	0.00	1.50	713.7	1.17	556.3	1.00
2 TR	0.906	1.00	0.51	0.00	1.51	789.5	1.16	608.9	1.00
West: Route 67 EB									
1 L	0.680	0.87	0.16	0.08	1.11	277.2	0.40	99.2	0.87
2 TR	1.240	1.00	2.63	0.00	3.63	2807.1	5.99	4631.2	1.00

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale Fixed	Flow Scale Var	Peak Flow Factor
South: Route 9 NB								
	South	3L	Left	1	0	1.00	1.00	0.86
	East	8R	Right	102	3	1.00	1.00	0.86
	North	8T	Thru	305	9	1.00	1.00	0.86
	West	3L	Left	209	6	1.00	1.00	0.86
East: Dunning Street WB								
	South	1L	Left	190	2	1.00	1.00	0.86
	East	1L	Left	1	0	1.00	1.00	0.86
	North	6R	Right	91	2	1.00	1.00	0.86
	West	6T	Thru	558	0	1.00	1.00	0.86
North: Route 9 SB								
	South	4T	Thru	536	22	1.00	1.00	0.86
	East	7L	Left	145	0	1.00	1.00	0.86
	North	7L	Left	1	0	1.00	1.00	0.86
	West	4R	Right	294	3	1.00	1.00	0.86
West: Route 67 EB								
	South	2R	Right	382	8	1.00	1.00	0.86
	East	2T	Thru	380	4	1.00	1.00	0.86
	North	5L	Left	202	13	1.00	1.00	0.86
	West	5L	Left	35	0	1.00	1.00	0.86

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

Go to Table Links (Top)

Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	210	6	0	0	0	0
8T T	0	0	305	9	0	0
8R R	0	0	0	0	102	3
East: Dunning Street WB						
1L L	191	2	0	0	0	0
6T T	0	0	558	0	0	0
6R R	0	0	0	0	91	2
North: Route 9 SB						
7L L	147	0	0	0	0	0
4T T	0	0	536	22	0	0

```
   4R R       0      0      0      0    294      3
-----------------------------------------------
West: Route 67 EB
   5L L     237     13      0      0      0      0
   2T T       0      0    380      4      0      0
   2R R       0      0      0      0    382      8
-----------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

```
Intersection ID: 1
Roundabout

-------------------------------------------------
  Mov          Left         Through        Right
  ID        ----------    ----------    ----------
            Total  %HV    Total  %HV    Total  %HV
-------------------------------------------------
Demand flows in veh/h as used by the program
South: Route 9 NB
   3L L      216   3.0       0   0.0       0   0.0
   8T T        0   0.0     314   3.0       0   0.0
   8R R        0   0.0       0   0.0     105   3.0
-------------------------------------------------
East: Dunning Street WB
   1L L      193   1.0       0   0.0       0   0.0
   6T T        0   0.0     558   0.0       0   0.0
   6R R        0   0.0       0   0.0      93   2.0
-------------------------------------------------
North: Route 9 SB
   7L L      147   0.0       0   0.0       0   0.0
   4T T        0   0.0     558   4.0       0   0.0
   4R R        0   0.0       0   0.0     297   1.0
-------------------------------------------------
West: Route 67 EB
   5L L      250   5.2       0   0.0       0   0.0
   2T T        0   0.0     384   1.0       0   0.0
   2R R        0   0.0       0   0.0     390   2.0
-------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (Customary)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  HCM Delay Model option used
  HCM Queue Model option used
```

```
Level of Service based on: Delay (HCM 2000)
Queue percentile: 95%
```

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Parameters Used in Cost Calculations
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

```
Intersection ID: 1
Roundabout


  Pump price of fuel ($/US gal)              =     2.400
  Fuel resource cost factor                  =      0.70
  Ratio of running cost to fuel cost         =       3.0
  Average income ($/h)                       =     19.00
  Time value factor                          =      0.40
  Light vehicle mass (1000 lb)               =       3.1
  Heavy vehicle mass (1000 lb)               =      24.0
  Light vehicle idle fuel rate (US gal/h)    =     0.360
  Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

Go to Table Links (Top)

Diagnostics
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022

```
Geometric delay is less than 2 seconds for some movements.  The negotiation
speed may be too high or the approach and exit speeds may be too low for
given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds,
negotiation radius or negotiation speed data in the Path Data dialog.
```

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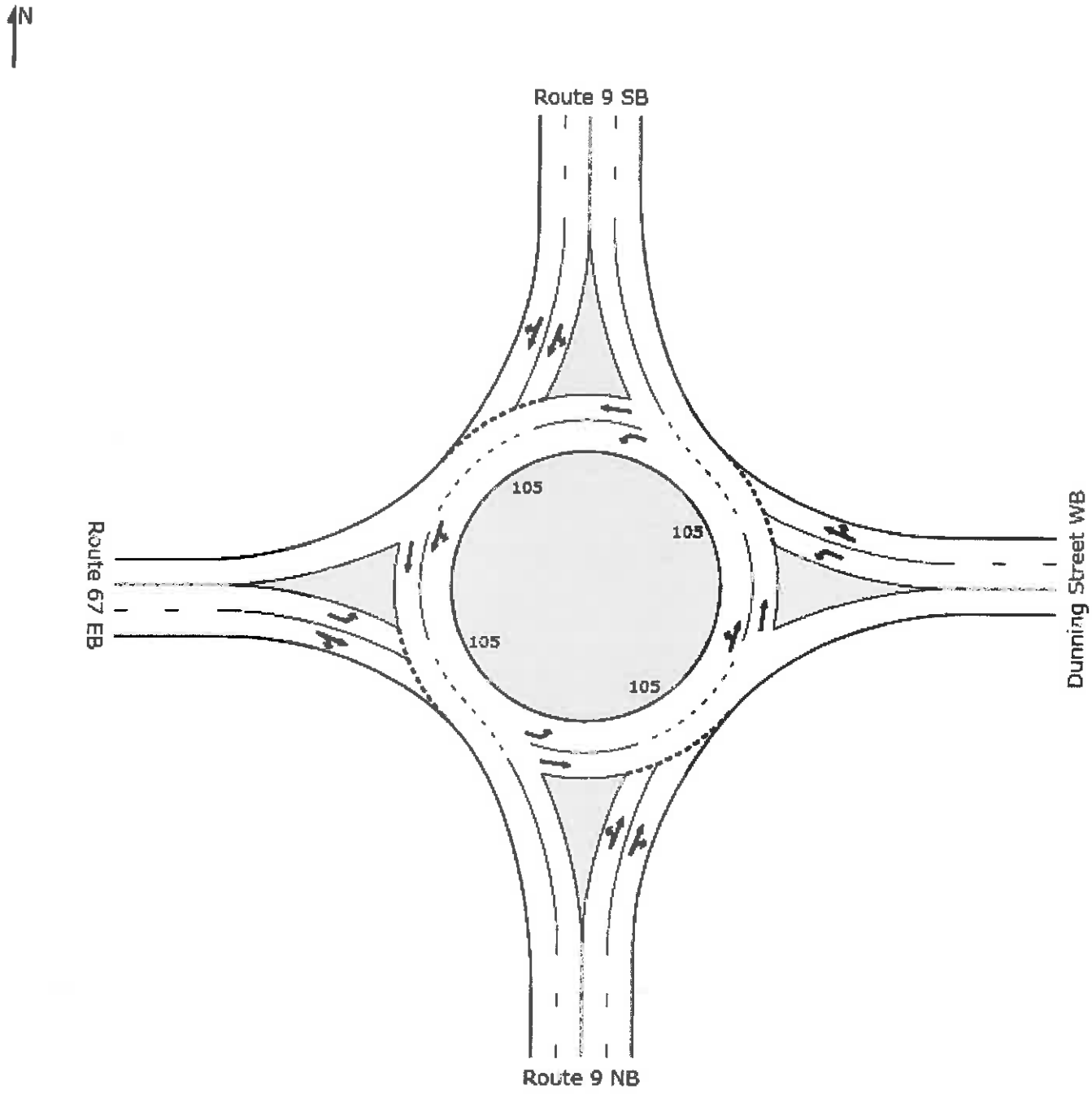
N
Route 9 SB
Route 67 EB
Dunning Street WB
Route 9 NB
105
105
105
105

DETAILED OUTPUT

Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Route 9/Route 67/Dunning Street
Build 2022 with Imp
AM Peak Hour
Roundabout

OUTPUT TABLE LINKS

Roundabouts
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Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
                                                Circulating/Exiting Stream
 Cent  Circ  Insc  Ent Ent Cir Ent Av.Ent ------------------------------------
Island Width Diam. Rad Ang Lan Lan Lane   Flow %HV Adjust. %Exit  Cap.    O-D
 Diam                              Width            Flow   Incl. Constr. Factor
  ft    ft    ft   ft  deg          ft   veh/h      pcu/h        Effect
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
```

```
 105    33   171  100  30   2   3  13.00  781  2.1   798     0     N     0.832
   Exclusive Slip lane (exiting flow):  530   0.7    534     0     N    0.907
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   3  13.00  781  3.7   810     0     N     0.887
   Exclusive Slip lane (exiting flow):  530   4.2    553     0     N    0.939
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00 1002  0.8  1011     0     N     0.841
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  899  2.7   923     0     N     0.809
-----------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

Go to Table Links (Top)

Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
Turn Lane    Lane    ---- Circulating/Exiting Stream ---   Critical Gap
     No.    Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                     Rate  Speed   Dist Headway  Bunched   Hdwy    Dist  Headway
                    pcu/h   mph     ft    sec               sec     ft     sec
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left   1 Subdominant  798   20.5   135.8  1.50   0.522    3.53   106.2    2.43
Thru   1 Subdominant  798   20.5   135.8  1.50   0.522    3.53   106.2    2.43
       2 Dominant     798   20.5   135.8  1.50   0.522    3.04    91.5    2.09
Right  3 Excl. Slip   534E  22.5   222.6  1.40   0.365    3.33   110.0    2.19
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left   1 Subdominant  810   19.8   128.8  1.38   0.497    3.45   100.0    2.38
Thru   1 Subdominant  810   19.8   128.8  1.38   0.497    3.42    99.0    2.36
       2 Dominant     810   19.8   128.8  1.38   0.497    2.94    85.2    2.03
Right  3 Excl. Slip   553E  21.4   204.4  1.79   0.455    3.28   102.8    2.17
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left   1 Subdominant 1011   21.1   110.2  1.31   0.563    3.58   110.7    2.54
Thru   1 Subdominant 1011   21.1   110.2  1.31   0.563    3.72   115.2    2.64
       2 Dominant    1011   21.1   110.2  1.31   0.563    3.50   108.4    2.48
Right  2 Dominant    1011   21.1   110.2  1.31   0.563    3.40   105.3    2.41
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left   1 Subdominant  923   21.6   123.7  1.41   0.555    3.84   121.8    2.69
Thru   1 Subdominant  923   21.6   123.7  1.41   0.555    3.69   117.0    2.58
       2 Dominant     923   21.6   123.7  1.41   0.555    3.49   110.8    2.45
Right  2 Dominant     923   21.6   123.7  1.41   0.555    3.52   111.8    2.47
-----------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.
  E  Exiting flow for slip lane traffic

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

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Roundabout Pedestrian Effects
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

ROUNDABOUT ENTRY

Turn	Pedestrian Flow Rate	Circulating Flow Rate	Adjustment Factor
South: Route 9 NB			
Left	1	798	1.000
Thru	1	798	1.000
Right	1	534	0.999
East: Dunning Street WB			
Left	1	810	1.000
Thru	1	810	1.000
Right	1	553	0.999
North: Route 9 SB			
Left	1	1011	1.000
Thru	1	1011	1.000
Right	1	1011	1.000
West: Route 67 EB			
Left	2	923	1.000
Thru	2	923	1.000
Right	2	923	1.000

ROUNDABOUT EXIT

Pedestrian Flow Rate (ped/h)	Conflict Zone Length (ft)	Critical Gap (sec)	Follow-up Headway (sec)	Exit Lane Capacity (veh/h)	Total Exit Flow (veh/h)	Average Exit Flow (veh/h/lane)

Go to Table Links (Top)

Movements

Movement Capacity Parameters
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Movement Flow veh/h	HV %	Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	216	3.0	781	2.1	798	646	0.85	154	100	0.335
8T T	314	3.0	781	2.1	798	938	0.85	154	100	0.335
8R R	105	3.0	530	0.7	534	1059	0.85	760	100	0.099
East: Dunning Street WB										
1L L	193	1.0	781	3.7	810	455	0.85	100	100	0.424
6T T	558	0.0	781	3.7	810	1316	0.85	100	100	0.424
6R R	93	2.0	530	4.2	553	1072	0.85	880	100	0.087
North: Route 9 SB										
7L L	147	0.0	1002	0.8	1011	178	0.85	3	100	0.822

4T	T	558	4.0	1002	0.8	1011	679	0.85	3	100	0.822
4R	R	297	1.0	1002	0.8	1011	361	0.85	3	100	0.822
West: Route 67 EB											
5L	L	250	5.2	899	2.7	923	294	0.85	0	100	0.850*
2T	T	384	1.0	899	2.7	923	451	0.85	0	100	0.850*
2R	R	390	2.0	899	2.7	923	458	0.85	0	100	0.850*

* Maximum degree of saturation

Go to Table Links (Top)

Movement Performance
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID		Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB										
3L	L	0.56	0.67	9.3	0.89	193.4	4.87	76.7	3.6	21.3
8T	T	0.69	0.83	8.0	0.74	233.9	6.24	100.7	4.2	23.9
8R	R	0.12	0.15	4.3	0.54	56.8	1.75	33.4	1.3	25.4
East: Dunning Street WB										
1L	L	0.53	0.64	10.0	0.96	186.2	4.60	73.9	3.4	21.8
6T	T	1.37	1.65	8.9	0.77	429.4	11.72	194.9	8.2	23.8
6R	R	0.11	0.13	4.1	0.53	49.7	1.63	32.3	1.3	25.8
North: Route 9 SB										
7L	L	1.33	1.60	32.7	1.29	189.6	4.45	31.8	2.7	12.0
4T	T	4.92	5.91	31.8	1.24	694.6	15.93	102.4	8.7	11.7
4R	R	2.50	3.00	30.4	1.26	373.7	8.30	53.9	4.5	12.0
West: Route 67 EB										
5L	L	2.53	3.03	36.4	1.32	331.2	8.93	78.7	5.7	13.9
2T	T	3.77	4.53	35.4	1.31	504.0	13.05	106.7	7.7	13.9
2R	R	3.66	4.39	33.8	1.32	513.3	12.97	107.7	7.5	14.3

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Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID		Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB							
3L	L	51.81	3.7	35.4	2.41	0.058	0.071
8T	T	62.21	4.7	44.5	3.05	0.072	0.092
8R	R	19.58	1.5	14.1	0.94	0.022	0.029
		133.61	9.9	94.1	6.40	0.152	0.191
East: Dunning Street WB							
1L	L	48.36	3.4	31.9	2.09	0.053	0.062
6T	T	116.02	8.3	78.3	5.10	0.131	0.155
6R	R	18.42	1.4	13.1	0.84	0.021	0.026
		182.79	13.0	123.2	8.03	0.205	0.243
North: Route 9 SB							

7L L	35.85	2.2	20.5	1.48	0.039	0.040
4T T	120.09	8.0	75.8	5.96	0.138	0.163
4R R	61.68	3.9	37.3	2.91	0.070	0.078
	217.63	14.1	133.6	10.35	0.247	0.281
West: Route 67 EB						
5L L	78.57	5.1	48.5	3.28	0.084	0.095
2T T	101.81	6.4	61.1	4.23	0.111	0.120
2R R	103.38	6.7	63.2	4.44	0.114	0.126
	283.76	18.2	172.7	11.95	0.308	0.340
INTERSECTION:	817.79	55.3	523.6	36.74	0.913	1.056

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.42	20.5	287.0	19.55	0.472	0.577
8T T	0.38	21.4	274.9	18.83	0.443	0.565
8R R	0.36	22.4	263.0	17.46	0.415	0.535
	0.39	21.2	277.4	18.87	0.449	0.564
East: Dunning Street WB						
1L L	0.41	21.9	268.1	17.55	0.449	0.524
6T T	0.37	23.6	249.5	16.27	0.416	0.494
6R R	0.35	23.5	250.8	16.15	0.398	0.501
	0.38	23.1	254.2	16.57	0.423	0.502
North: Route 9 SB						
7L L	0.70	14.7	400.4	28.91	0.761	0.780
4T T	0.73	12.8	459.7	36.19	0.836	0.991
4R R	0.71	13.7	429.8	33.54	0.811	0.898
	0.72	13.3	441.1	34.20	0.816	0.929
West: Route 67 EB						
5L L	0.62	15.4	382.7	25.90	0.663	0.749
2T T	0.59	16.6	355.4	24.63	0.646	0.696
2R R	0.60	16.1	364.6	25.63	0.655	0.726
	0.60	16.1	366.1	25.34	0.654	0.721
INTERSECTION:	0.51	18.0	327.6	22.99	0.571	0.661

Go to Table Links (Top)

Intersection Negotiation Data
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?

South: Route 9 NB								
	South	Left	65.7	16.3	361.2	1450	420	No
	East	Right	143.1	21.9	66.0	1450	241	No
	North	Thru	200.1	24.9	161.6	1450	248	No
	West	Left	65.7	16.3	258.0	1450	420	No
East: Dunning Street WB								
	South	Left	65.7	16.3	258.0	1600	395	No
	East	Left	65.7	16.3	361.2	1600	395	No
	North	Right	143.1	21.9	66.0	1600	239	No
	West	Thru	200.1	24.9	161.6	1600	244	No
North: Route 9 SB								
	South	Thru	200.1	24.9	161.6	725	279	No
	East	Left	65.7	16.3	258.0	725	372	No
	North	Left	65.7	16.3	361.2	725	372	No
	West	Right	123.3	20.7	66.2	725	218	No
West: Route 67 EB								
	South	Right	123.3	20.7	66.2	1225	227	No
	East	Thru	200.1	24.9	161.6	1225	281	No
	North	Left	65.7	16.3	258.0	1225	408	No
	West	Left	65.7	16.3	361.2	1225	408	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

Go to Table Links (Top)

Movement Speeds and Geometric Delay
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	30.0	16.3	16.3	30.0			23.6	21.3	8.2
8T T	30.0	24.9	24.9	30.0			25.5	23.9	1.8
8R R	30.0	21.9	21.9	30.0			26.0	25.4	2.7
East: Dunning Street WB									
1L L	30.0	16.3	16.3	30.0	11.7		24.5	21.8	8.2
6T T	30.0	24.9	24.9	30.0	12.3		25.6	23.8	1.7
6R R	30.0	21.9	21.9	30.0			26.2	25.8	2.7
North: Route 9 SB									
7L L	30.0	16.3	16.3	30.0	10.7		19.9	12.0	8.2
4T T	30.0	24.9	24.9	30.0	10.6		18.9	11.7	1.8
4R R	30.0	20.7	20.7	30.0	10.9		19.3	12.0	3.1
West: Route 67 EB									
5L L	30.0	16.3	16.3	30.0	10.8		21.5	13.9	8.5
2T T	30.0	24.9	24.9	30.0	11.1		21.1	13.9	1.7
2R R	30.0	20.7	20.7	30.0	11.1		21.6	14.3	3.1

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

Go to Table Links (Top)

Lanes

Lane Performance
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 95% Back veh	Queue 95% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	238	712	0.335	9.3	0.88	1.9	48.0	2500.0
2 T	292	872	0.335	7.9	0.74	2.0	51.9	2500.0
3 R	105	1059	0.099	4.3	0.54	0.5	12.3	200.0T
East: Dunning Street WB								
1 LT	336	791	0.424	10.0	0.89	2.5	61.8	350.0
2 T	416	980	0.424	8.5	0.76	2.6	64.8	1600.0
3 R	93	1072	0.087	4.1	0.53	0.4	11.0	200.0T
North: Route 9 SB								
1 LT	476	579	0.822	32.7	1.26	8.1	206.9	725.0
2 TR	525	639	0.822	30.4	1.25	8.5	215.3	725.0
West: Route 67 EB								
1 LT	486	571	0.850	36.4	1.32	9.4	240.1	1225.0
2 TR	537	632	0.850	33.8	1.32	9.8	249.2	1225.0

T Short lane due to specification of Turn Bay

Go to Table Links (Top)

Lane Flow and Capacity Information
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	216	22	0	238	150	712	0.335	100
2 T	0	292	0	292	150	872	0.335	100
3 R	0	0	105	105	105	1059	0.099	100
East: Dunning Street WB								
1 LT	193	143	0	336	150	791	0.424	100
2 T	0	416	0	416	150	980	0.424	100
3 R	0	0	93	93	93	1072	0.087	100
North: Route 9 SB								
1 LT	147	330	0	476	150	579	0.822	100
2 TR	0	229	297	525	150	639	0.822	100
West: Route 67 EB								
1 LT	250	236	0	486	150	571	0.850	100
2 TR	0	148	390	537	150	632	0.850	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

Go to Table Links (Top)

Lane, Approach and Intersection Performance
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (sec) 1st	2nd	Deg Sat x	Aver. Delay sec	Longest Queue ft	Shrt Lane ft
South: Route 9 NB												
1 LT	216	22		238	3				0.335	9.3	48	2500
2 T		292		292	3				0.335	7.9	52	2500
3 R			105	105	3				0.099	4.3	12	200
	216	314	105	635	3				0.335	7.8	52	
East: Dunning Street WB												
1 LT	193	143		336	1				0.424	10.0	62	350
2 T		416		416	0				0.424	8.5	65	1600
3 R			93	93	2				0.087	4.1	11	200
	193	558	93	844	0				0.424	8.6	65	
North: Route 9 SB												
1 LT	147	330		476	3				0.822	32.7	207	725
2 TR		229	297	525	2				0.822	30.4	215	725
	147	558	297	1001	3				0.822	31.5	215	
West: Route 67 EB												
1 LT	250	236		486	3				0.850	36.4	240	1225
2 TR		148	390	537	2				0.850	33.8	249	1225
	250	384	390	1023	2				0.850	35.1	249	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	3503	2	0.850	22.7	249

Peak flow period = 15 minutes.

Queue values in this table are 95% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

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Driver Characteristics
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec
South: Route 9 NB						
1 LT	17.1	1483	2.43	60.91	25.60	1.41
2 T	24.9	1720	2.09	76.36	25.60	1.39
3 R	NA - Short Lane					
East: Dunning Street WB						
1 LT	20.0	1519	2.37	69.36	25.11	1.51
2 T	24.9	1776	2.03	73.97	25.00	1.34
3 R	NA - Short Lane					

North: Route 9 SB						
1 LT	22.2	1380	2.61	85.11	25.55	1.83
2 TR	22.5	1473	2.44	80.74	25.46	1.67
West: Route 67 EB						
1 LT	20.5	1364	2.64	79.23	25.63	1.78
2 TR	21.9	1462	2.46	78.98	25.34	1.67

Saturation Flow and Saturation Headway are derived from follow-up headway.

Go to Table Links (Top)

Lane Delays
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
		Delay (seconds/veh)								
South: Route 9 NB										
1 LT	0.335	6.7	2.5	9.3	0.0	5.7	0.0	5.7	7.6	9.3
2 T	0.335	5.8	2.1	7.9	0.0	2.9	0.0	2.9	1.8	7.9
3 R	0.099	3.9	0.4	4.3	0.0	1.0	0.0	1.0	2.7	4.3
East: Dunning Street WB										
1 LT	0.424	6.7	3.3	10.0	0.0	6.4	0.4	6.1	5.5	10.0
2 T	0.424	5.8	2.7	8.5	0.0	3.7	0.2	3.4	1.7	8.5
3 R	0.087	3.8	0.3	4.1	0.0	0.8	0.0	0.8	2.7	4.1
North: Route 9 SB										
1 LT	0.822	10.3	22.4	32.7	0.0	27.5	4.1	23.5	3.7	32.7
2 TR	0.822	9.7	20.6	30.4	0.0	24.5	4.0	20.5	2.5	30.4
West: Route 67 EB										
1 LT	0.850	10.6	25.9	36.4	0.0	31.6	4.5	27.1	5.2	36.4
2 TR	0.850	9.9	23.9	33.8	0.0	27.8	4.4	23.4	2.8	33.8

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

Geometric delay is less than 2 seconds for some movements. The negotiation speed may be too high or the approach and exit speeds may be too low for given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds, negotiation radius or negotiation speed data in the Path Data dialog.

Go to Table Links (Top)

Lane Queues (Vehicles)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

	Deg.	Ovrfl.	Back of Queue (veh)		Queue	Prob.	P'ile	Cyc-Av. Queue

Lane No.	Satn x	Queue No	Nb1	Nb2	Nb	95%	Stor. Ratio	Block %	Block %	Nc	95%
South: Route 9 NB											
1 LT	0.335	0.0	0.8	0.0	0.8	1.9	0.02	0.0	100.0	0.6	1.1
2 T	0.335	0.0	0.8	0.0	0.8	2.0	0.02	0.0	100.0	0.6	1.2
3 R	0.099	0.0	0.2	0.0	0.2	0.5	0.06	0.0	100.0	0.1	0.2
East: Dunning Street WB											
1 LT	0.424	0.1	0.9	0.1	1.0	2.5	0.18	0.0	100.0	0.9	1.7
2 T	0.424	0.0	1.0	0.0	1.0	2.6	0.04	0.0	100.0	1.0	1.8
3 R	0.087	0.0	0.2	0.0	0.2	0.4	0.06	0.0	100.0	0.1	0.2
North: Route 9 SB											
1 LT	0.822	1.1	2.1	1.2	3.3	8.1	0.29	0.0	100.0	4.3	7.8
2 TR	0.822	1.1	2.1	1.3	3.4	8.5	0.30	0.0	100.0	4.4	8.0
West: Route 67 EB											
1 LT	0.850	1.3	2.3	1.5	3.8	9.4	0.20	0.0	100.0	4.9	8.9
2 TR	0.850	1.3	2.4	1.6	4.0	9.8	0.20	0.0	100.0	5.0	9.2

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queues (Distance)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	95%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	95%
South: Route 9 NB											
1 LT	0.335	0.0	19.3	0.0	19.3	48.0	0.02	0.0	100.0	15.7	28.4
2 T	0.335	0.0	20.9	0.0	20.9	51.9	0.02	0.0	100.0	16.3	29.6
3 R	0.099	0.0	4.9	0.0	4.9	12.3	0.06	0.0	100.0	3.2	5.8
East: Dunning Street WB											
1 LT	0.424	1.4	23.4	1.5	24.9	61.8	0.18	0.0	100.0	23.4	42.4
2 T	0.424	0.9	25.0	1.0	26.1	64.8	0.04	0.0	100.0	24.4	44.3
3 R	0.087	0.0	4.4	0.0	4.4	11.0	0.06	0.0	100.0	2.7	4.9
North: Route 9 SB											
1 LT	0.822	27.2	52.5	30.8	83.3	206.9	0.29	0.0	100.0	110.5	200.5
2 TR	0.822	27.7	54.4	32.2	86.6	215.3	0.30	0.0	100.0	112.8	204.7
West: Route 67 EB											
1 LT	0.850	32.7	58.8	37.8	96.6	240.1	0.20	0.0	100.0	125.9	228.4
2 TR	0.850	33.2	60.8	39.5	100.3	249.2	0.20	0.0	100.0	128.0	232.2

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1

Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (veh) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.335	0.8	1.0	1.4	1.6	1.9	2.1
2 T	0.335	0.8	1.1	1.5	1.7	2.0	2.2
3 R	0.099	0.2	0.2	0.4	0.4	0.5	0.5
East: Dunning Street WB							
1 LT	0.424	1.0	1.3	1.8	2.1	2.5	2.7
2 T	0.424	1.0	1.3	1.9	2.2	2.6	2.9
3 R	0.087	0.2	0.2	0.3	0.4	0.4	0.5
North: Route 9 SB							
1 LT	0.822	3.3	4.2	5.9	6.9	8.1	9.0
2 TR	0.822	3.4	4.4	6.2	7.2	8.5	9.4
West: Route 67 EB							
1 LT	0.850	3.8	4.9	6.9	8.0	9.4	10.4
2 TR	0.850	4.0	5.1	7.2	8.4	9.8	10.9

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Distance)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.335	19.3	25.0	35.2	40.8	48.0	53.3
2 T	0.335	20.9	27.0	38.1	44.1	51.9	57.6
3 R	0.099	4.9	6.4	9.0	10.4	12.3	13.6
East: Dunning Street WB							
1 LT	0.424	24.8	32.2	45.4	52.5	61.8	68.6
2 T	0.424	26.0	33.7	47.6	55.1	64.8	71.9
3 R	0.087	4.4	5.7	8.1	9.4	11.0	12.2
North: Route 9 SB							
1 LT	0.822	83.2	107.8	152.0	176.0	206.9	229.7
2 TR	0.822	86.6	112.2	158.1	183.1	215.3	239.0
West: Route 67 EB							
1 LT	0.850	96.6	125.1	176.4	204.2	240.1	266.5
2 TR	0.850	100.2	129.8	183.0	211.9	249.2	276.5

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Stops
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.335	0.73	0.00	0.16	0.88	210.3	0.00	0.0	0.74
2 T	0.335	0.69	0.00	0.05	0.74	217.0	0.00	0.0	0.74
3 R	0.099	0.40	0.00	0.14	0.54	56.8	0.00	0.0	0.52
East: Dunning Street WB									
1 LT	0.424	0.72	0.03	0.14	0.89	300.0	0.06	20.8	0.72
2 T	0.424	0.68	0.02	0.06	0.76	315.7	0.04	14.7	0.72
3 R	0.087	0.39	0.00	0.14	0.53	49.7	0.00	0.0	0.53
North: Route 9 SB									
1 LT	0.822	0.93	0.30	0.03	1.26	599.4	0.71	339.0	0.93
2 TR	0.822	0.94	0.30	0.02	1.25	658.5	0.69	364.6	0.94
West: Route 67 EB									
1 LT	0.850	0.97	0.33	0.01	1.32	640.6	0.77	374.9	0.97
2 TR	0.850	0.98	0.33	0.01	1.32	707.9	0.75	404.7	0.98

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	HV	Flow Scale Fixed	Var	Peak Flow Factor
South: Route 9 NB								
	South	3L	Left	1	0	1.00	1.00	0.86
	East	8R	Right	102	3	1.00	1.00	0.86
	North	8T	Thru	305	9	1.00	1.00	0.86
	West	3L	Left	209	6	1.00	1.00	0.86
East: Dunning Street WB								
	South	1L	Left	190	2	1.00	1.00	0.86
	East	1L	Left	1	0	1.00	1.00	0.86
	North	6R	Right	91	2	1.00	1.00	0.86
	West	6T	Thru	558	0	1.00	1.00	0.86
North: Route 9 SB								
	South	4T	Thru	536	22	1.00	1.00	0.86
	East	7L	Left	145	0	1.00	1.00	0.86
	North	7L	Left	1	0	1.00	1.00	0.86
	West	4R	Right	294	3	1.00	1.00	0.86
West: Route 67 EB								
	South	2R	Right	382	8	1.00	1.00	0.86
	East	2T	Thru	380	4	1.00	1.00	0.86
	North	5L	Left	202	13	1.00	1.00	0.86
	West	5L	Left	35	0	1.00	1.00	0.86

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

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Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	210	6	0	0	0	0
8T T	0	0	305	9	0	0
8R R	0	0	0	0	102	3
East: Dunning Street WB						
1L L	191	2	0	0	0	0
6T T	0	0	558	0	0	0
6R R	0	0	0	0	91	2
North: Route 9 SB						
7L L	147	0	0	0	0	0
4T T	0	0	536	22	0	0
4R R	0	0	0	0	294	3
West: Route 67 EB						
5L L	237	13	0	0	0	0
2T T	0	0	380	4	0	0
2R R	0	0	0	0	382	8

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

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Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID	Left Total	Left %HV	Through Total	Through %HV	Right Total	Right %HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	216	3.0	0	0.0	0	0.0
8T T	0	0.0	314	3.0	0	0.0
8R R	0	0.0	0	0.0	105	3.0
East: Dunning Street WB						
1L L	193	1.0	0	0.0	0	0.0
6T T	0	0.0	558	0.0	0	0.0
6R R	0	0.0	0	0.0	93	2.0
North: Route 9 SB						
7L L	147	0.0	0	0.0	0	0.0
4T T	0	0.0	558	4.0	0	0.0
4R R	0	0.0	0	0.0	297	1.0
West: Route 67 EB						
5L L	250	5.2	0	0.0	0	0.0
2T T	0	0.0	384	1.0	0	0.0
2R R	0	0.0	0	0.0	390	2.0

```
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

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Other

Model Settings
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (Customary)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  HCM Delay Model option used
  HCM Queue Model option used
  Level of Service based on: Delay (HCM 2000)
  Queue percentile: 95%
```

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Parameters Used in Cost Calculations
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

```
Intersection ID: 1
Roundabout


   Pump price of fuel ($/US gal)              =     2.400
   Fuel resource cost factor                  =      0.70
   Ratio of running cost to fuel cost         =       3.0
   Average income ($/h)                       =     19.00
   Time value factor                          =      0.40
   Light vehicle mass (1000 lb)               =       3.1
   Heavy vehicle mass (1000 lb)               =      24.0
   Light vehicle idle fuel rate (US gal/h)    =     0.360
   Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

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Diagnostics
Site:Route 9/Route 67/Dunning Street - AM Peak - Build 2022 w/Imp

```
Geometric delay is less than 2 seconds for some movements.  The negotiation
speed may be too high or the approach and exit speeds may be too low for
given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds,
negotiation radius or negotiation speed data in the Path Data dialog.
```

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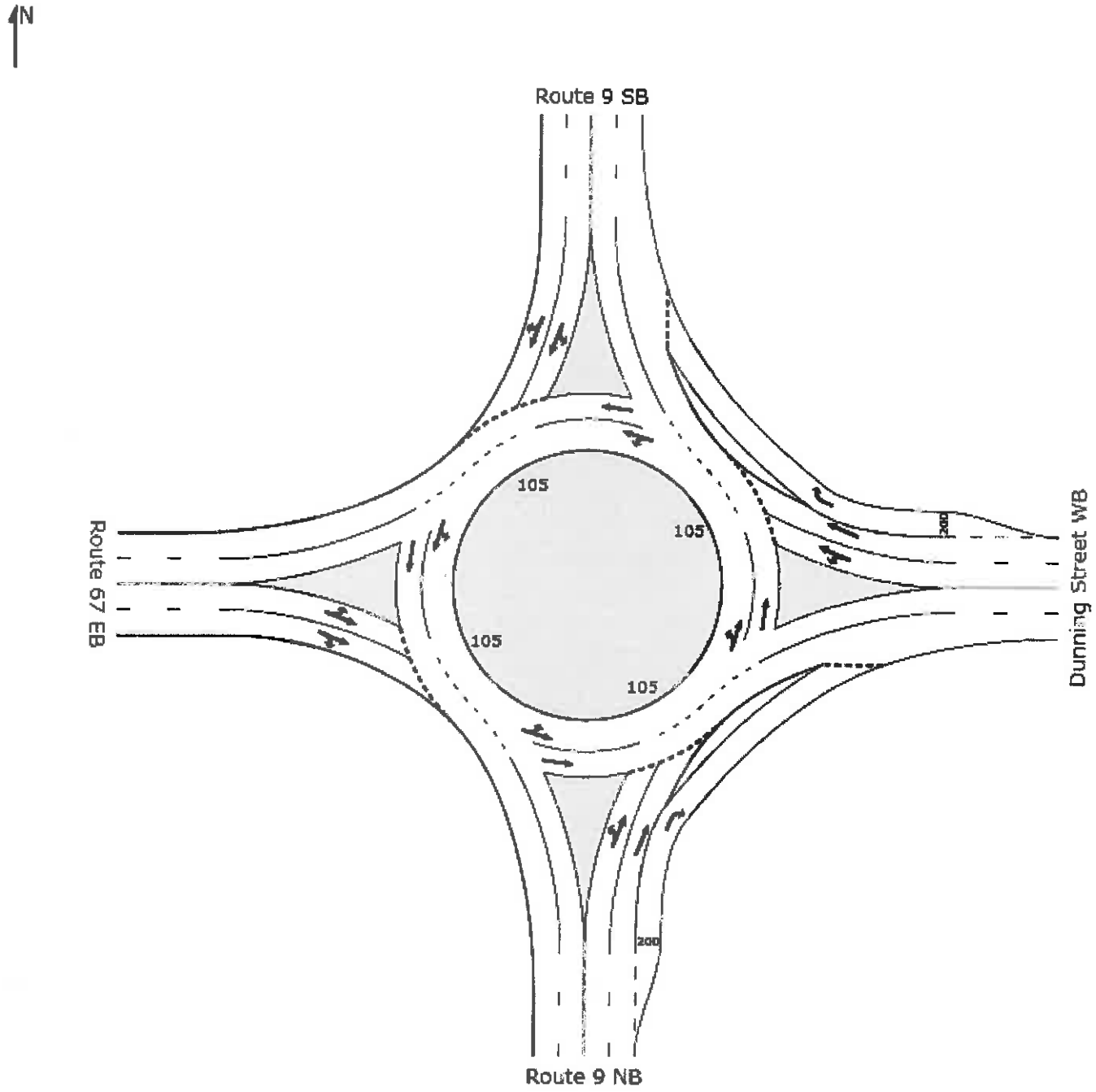
N
Route 9 SB
Route 67 EB
Dunning Street WB
Route 9 NB
105
105
105
105
200
200

DETAILED OUTPUT

Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Route 9/Route 67/Dunning Street
No-Build 2022
PM Peak Hour
Roundabout

OUTPUT TABLE LINKS

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- Roundabout Gap Acceptance Parameters
- Roundabout Pedestrian Effects

Movements
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- Lane Queues (Vehicles)
- Lane Queues (Distance)
- Lane Queue Percentiles (Vehicles)
- Lane Queue Percentiles (Distance)
- Lane Stops

Flow Rates and Demand Analysis
- Movement Definitions and Flow Rates (O-D)
- Flow Rates (Separate Light and Heavy Vehicles)
- Flow Rates (Total Vehicles and Percent Heavy)

Other
- Model Settings
- Parameters Used in Cost Calculations
- Diagnostics

Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
                                                Circulating/Exiting Stream
 Cent  Circ  Insc  Ent Ent Cir Ent Av.Ent -----------------------------------
Island Width Diam. Rad Ang Lan Lan Lane   Flow %HV Adjust. %Exit  Cap.    O-D
 Diam                              Width            Flow   Incl. Constr. Factor
  ft    ft    ft   ft  deg          ft   veh/h      pcu/h        Effect
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
```

```
 105    33   171  100  30   2   2  13.00 1063  0.5  1069     0     Y     0.755
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00 1298  1.0  1311     0     N     0.730
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  790  0.5   794     0     Y     0.863
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  788  1.2   798     0     N     0.854
-----------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

Go to Table Links (Top)

Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
Turn Lane    Lane    ---- Circulating/Exiting Stream ---   Critical Gap
     No.     Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                      Rate  Speed   Dist Headway Bunched   Hdwy    Dist  Headway
                     pcu/h   mph     ft    sec              sec     ft     sec
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant 1069   20.1    99.1  1.19   0.546    3.54   104.0    2.52
Thru  1 Subdominant 1069   20.1    99.1  1.19   0.546    3.61   106.1    2.57
      2 Dominant    1069   20.1    99.1  1.19   0.546    3.38    99.5    2.41
Right 2 Dominant    1069   20.1    99.1  1.19   0.546    3.32    97.5    2.37
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant 1311   20.4    82.0  1.42   0.701    4.55   135.9    3.33
Thru  2 Dominant    1311   20.4    82.0  1.42   0.701    3.14    93.8    2.30
Right 2 Dominant    1311   20.4    82.0  1.42   0.701    3.11    92.9    2.28
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  794   19.9   132.3  1.59   0.543    3.73   108.7    2.56
Thru  1 Subdominant  794   19.9   132.3  1.59   0.543    3.80   110.8    2.61
      2 Dominant     794   19.9   132.3  1.59   0.543    3.66   106.9    2.52
Right 2 Dominant     794   19.9   132.3  1.59   0.543    3.66   106.9    2.52
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  798   21.3   141.3  1.42   0.502    4.09   128.1    2.82
Thru  2 Dominant     798   21.3   141.3  1.42   0.502    3.62   113.4    2.49
Right 2 Dominant     798   21.3   141.3  1.42   0.502    3.73   116.8    2.57
-----------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

Go to Table Links (Top)

Roundabout Pedestrian Effects
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

```
Intersection ID: 1
```

Roundabout

ROUNDABOUT ENTRY

Turn	Pedestrian Flow Rate	Circulating Flow Rate	Adjustment Factor
South: Route 9 NB			
Left	1	1069	1.000
Thru	1	1069	1.000
Right	1	1069	1.000
East: Dunning Street WB			
Left	1	1311	1.000
Thru	1	1311	1.000
Right	1	1311	1.000
North: Route 9 SB			
Left	1	794	1.000
Thru	1	794	1.000
Right	1	794	1.000
West: Route 67 EB			
Left	1	798	1.000
Thru	1	798	1.000
Right	1	798	1.000

ROUNDABOUT EXIT

Pedestrian Flow Rate (ped/h)	Conflict Zone Length (ft)	Critical Gap (sec)	Follow-up Headway (sec)	Exit Lane Capacity (veh/h)	Total Exit Flow (veh/h)	Average Exit Flow (veh/h/lane)

Go to Table Links (Top)

Movements

Movement Capacity Parameters
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Movement Flow veh/h	HV %	Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	248	0.0	1063	0.5	1069	262	0.85	-10	100	0.947
8T T	613	2.0	1063	0.5	1069	647	0.85	-10	100	0.947
8R R	194	0.0	1063	0.5	1069	204	0.85	-10	100	0.947
East: Dunning Street WB										
1L L	162	0.0	1298	1.0	1311	259	0.85	36	100	0.626
6T T	457	1.0	1298	1.0	1311	331	0.85	-38	100	1.382*
6R R	199	0.0	1298	1.0	1311	144	0.85	-38	100	1.382*
North: Route 9 SB										
7L L	162	0.1	790	0.5	794	252	0.85	32	100	0.645
4T T	462	2.0	790	0.5	794	717	0.85	32	100	0.645
4R R	253	2.0	790	0.5	794	392	0.85	32	100	0.645
West: Route 67 EB										
5L L	435	0.2	788	1.2	798	597	0.85	16	100	0.730

2T	T	484	1.0	788	1.2	798	464	0.85	-18	100	1.042
2R	R	247	4.0	788	1.2	798	237	0.85	-18	100	1.042

* Maximum degree of saturation

Go to Table Links (Top)

Movement Performance
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID		Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB										
3L	L	3.77	4.53	54.7	1.55	386.2	11.39	88.1	7.2	12.3
8T	T	9.01	10.81	52.9	1.56	954.0	26.97	196.6	16.0	12.3
8R	R	2.78	3.33	51.7	1.56	302.8	8.41	61.8	5.0	12.5
East: Dunning Street WB										
1L	L	1.70	2.04	37.7	1.10	179.1	6.23	62.2	4.1	15.0
6T	T	26.47	31.76	208.5	3.98	1820.9	61.39	159.6	32.1	5.0
6R	R	11.52	13.83	208.5	3.99	794.6	26.73	69.1	13.9	5.0
North: Route 9 SB										
7L	L	0.81	0.97	17.9	1.11	180.7	3.79	35.3	2.3	15.4
4T	T	2.27	2.72	17.7	1.02	471.2	9.98	84.8	5.4	15.6
4R	R	1.22	1.46	17.3	1.04	263.9	5.44	46.0	2.9	15.7
West: Route 67 EB										
5L	L	2.93	3.52	24.2	1.14	495.1	12.76	136.7	8.5	16.1
2T	T	9.36	11.23	69.6	2.19	1057.9	27.33	134.6	14.1	9.5
2R	R	4.78	5.74	69.6	2.17	537.7	13.94	68.4	7.2	9.5

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Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID		Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB							
3L	L	93.66	5.4	50.7	3.09	0.095	0.089
8T	T	210.17	12.7	120.0	7.76	0.219	0.223
8R	R	65.12	3.8	36.1	2.32	0.068	0.066
		368.95	21.8	206.9	13.17	0.381	0.378
East: Dunning Street WB							
1L	L	54.32	3.3	31.0	1.87	0.056	0.055
6T	T	388.19	18.2	172.4	9.17	0.355	0.257
6R	R	168.66	7.8	73.8	3.88	0.154	0.108
		611.16	29.3	277.2	14.93	0.564	0.420
North: Route 9 SB							
7L	L	32.17	2.1	20.1	1.53	0.037	0.041
4T	T	76.58	5.4	51.6	4.20	0.093	0.114
4R	R	42.42	3.0	28.6	2.35	0.051	0.064
		151.16	10.6	100.2	8.09	0.181	0.220

West: Route 67 EB						
5L L	114.90	7.3	69.6	4.73	0.125	0.134
2T T	183.18	10.4	98.9	6.70	0.190	0.183
2R R	96.32	5.7	54.0	3.73	0.101	0.104
	394.39	23.5	222.5	15.15	0.416	0.421
INTERSECTION:	1525.67	85.2	806.8	51.34	1.542	1.439

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Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.66	16.4	357.7	21.81	0.667	0.629
8T T	0.66	15.5	379.4	24.53	0.692	0.706
8R R	0.66	16.2	363.4	23.29	0.680	0.664
	0.66	15.9	371.0	23.62	0.683	0.679
East: Dunning Street WB						
1L L	0.54	19.0	309.4	18.71	0.557	0.553
6T T	1.51	8.8	671.5	35.71	1.381	0.999
6R R	1.52	8.9	663.6	34.90	1.381	0.971
	1.31	9.9	592.2	31.88	1.205	0.897
North: Route 9 SB						
7L L	0.57	16.6	353.6	27.04	0.650	0.730
4T T	0.56	15.6	378.0	30.78	0.678	0.838
4R R	0.57	15.2	386.1	31.83	0.696	0.862
	0.57	15.7	375.1	30.28	0.677	0.822
West: Route 67 EB						
5L L	0.52	18.6	316.1	21.50	0.567	0.609
2T T	0.85	12.9	456.4	30.91	0.879	0.846
2R R	0.88	12.0	491.0	33.86	0.916	0.942
	0.72	14.5	406.9	27.72	0.761	0.770
INTERSECTION:	0.83	13.4	438.6	27.91	0.838	0.782

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Intersection Negotiation Data
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?
South: Route 9 NB								
	South	Left	65.7	16.3	361.2	1450	387	No
	East	Right	123.3	20.7	66.2	1450	207	No
	North	Thru	200.1	24.9	161.6	1450	265	No

	West	Left	65.7	16.3	258.0	1450	387	No
East: Dunning Street WB								
	South	Left	65.7	16.3	258.0	1600	422	No
	East	Left	65.7	16.3	361.2	1600	422	No
	North	Right	123.3	20.7	66.2	1600	204	No
	West	Thru	200.1	24.9	161.6	1600	261	No
North: Route 9 SB								
	South	Thru	200.1	24.9	161.6	725	275	No
	East	Left	65.7	16.3	258.0	725	378	No
	North	Left	65.7	16.3	361.2	725	378	No
	West	Right	123.3	20.7	66.2	725	220	No
West: Route 67 EB								
	South	Right	123.3	20.7	66.2	1225	212	No
	East	Thru	200.1	24.9	161.6	1225	263	No
	North	Left	65.7	16.3	258.0	1225	433	No
	West	Left	65.7	16.3	361.2	1225	433	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

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Movement Speeds and Geometric Delay
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	30.0	16.3	16.3	30.0	10.4		21.2	12.3	8.2
8T T	30.0	24.9	24.9	30.0	10.4		20.8	12.3	1.7
8R R	30.0	20.7	20.7	30.0	10.6		21.2	12.5	3.1
East: Dunning Street WB									
1L L	30.0	16.3	16.3	30.0	9.0		22.7	15.0	8.2
6T T	30.0	24.9	24.9	30.0	10.4		13.7	5.0	1.7
6R R	30.0	20.7	20.7	30.0	10.5		13.8	5.0	3.1
North: Route 9 SB									
7L L	30.0	16.3	16.3	30.0	11.6		21.0	15.4	8.2
4T T	30.0	24.9	24.9	30.0	11.6		20.5	15.6	1.7
4R R	30.0	20.7	20.7	30.0	11.7		20.9	15.7	3.1
West: Route 67 EB									
5L L	30.0	16.3	16.3	30.0	11.0		21.4	16.1	8.4
2T T	30.0	24.9	24.9	30.0	11.6		17.3	9.5	1.7
2R R	30.0	20.7	20.7	30.0	11.5		17.5	9.5	3.2

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

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Lanes

Lane Performance

Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 95% Back veh	Queue 95% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	503	531	0.947	54.7	1.55	12.8	322.1	2500.0
2 TR	552	583	0.947	51.7	1.56	13.4	339.4	2500.0
East: Dunning Street WB								
1 L	162	259	0.626	37.7	1.10	3.6	90.9	350.0
2 TR	656	475	1.382	208.5	3.99	69.5	1747.8	1600.0
North: Route 9 SB								
1 LT	430	666	0.645	17.9	1.05	5.3	133.6	725.0
2 TR	448	694	0.645	17.3	1.03	5.4	136.5	725.0
West: Route 67 EB								
1 L	435	597	0.730	24.2	1.14	6.3	156.7	1225.0
2 TR	731	702	1.042	69.6	2.18	28.6	726.4	1225.0

Go to Table Links (Top)

Lane Flow and Capacity Information
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	248	254	0	503	150	531	0.947	100
2 TR	0	359	194	552	150	583	0.947	100
East: Dunning Street WB								
1 L	162	0	0	162	150	259	0.626	100
2 TR	0	457	199	656	150	475	1.382	100
North: Route 9 SB								
1 LT	162	267	0	430	150	666	0.645	100
2 TR	0	195	253	448	150	694	0.645	100
West: Route 67 EB								
1 L	435	0	0	435	150	597	0.730	100
2 TR	0	484	247	731	150	702	1.042	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

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Lane, Approach and Intersection Performance
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane	Demand Flow (veh/h)	Adj.	Eff Grn	Deg	Aver.	Longest	Shrt

No.	L	T	R	Tot	%HV	Basic Satf.	(sec) 1st	(sec) 2nd	Sat x	Delay sec	Queue ft	Lane ft
South: Route 9 NB												
1 LT	248	254		503	1				0.947	54.7	322	2500
2 TR		359	194	552	1				0.947	51.7	339	2500
	248	613	194	1055	1				0.947	53.1	339	
East: Dunning Street WB												
1 L	162			162	0				0.626	37.7	91	350
2 TR		457	199	656	1				1.382	208.5	1748	1600
	162	457	199	818	1				1.382	174.6	1748	
North: Route 9 SB												
1 LT	162	267		430	1				0.645	17.9	134	725
2 TR		195	253	448	2				0.645	17.3	136	725
	162	462	253	877	2				0.645	17.6	136	
West: Route 67 EB												
1 L	435			435	0				0.730	24.2	157	1225
2 TR		484	247	731	2				1.042	69.6	726	1225
	435	484	247	1167	1				1.042	52.7	726	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	3917	1	1.382	70.4	1748

Peak flow period = 15 minutes.

Queue values in this table are 95% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

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Driver Characteristics
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec
South: Route 9 NB						
1 LT	20.6	1412	2.55	77.23	25.20	1.72
2 TR	23.4	1502	2.40	82.35	25.26	1.66
East: Dunning Street WB						
1 L	16.3	1081	3.33	79.70	25.00	2.29
2 TR	23.6	1571	2.29	79.39	25.14	1.57
North: Route 9 SB						
1 LT	21.6	1389	2.59	82.30	25.25	1.80
2 TR	22.5	1429	2.52	83.23	25.40	1.75
West: Route 67 EB						
1 L	16.3	1278	2.82	67.41	25.04	1.77
2 TR	23.5	1430	2.52	86.68	25.40	1.78

Saturation Flow and Saturation Headway are derived from follow-up headway.

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Lane Delays

Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
		Delay (seconds/veh)								
South: Route 9 NB										
1 LT	0.947	11.5	43.1	54.7	0.0	49.6	7.6	42.0	4.9	54.7
2 TR	0.947	10.9	40.8	51.7	0.0	45.2	7.6	37.6	2.2	51.7
East: Dunning Street WB										
1 L	0.626	17.0	20.7	37.7	0.0	33.2	2.0	31.2	8.2	37.7
2 TR	1.382	12.6	195.9	208.5	0.0	202.0	40.8	161.2	2.2	208.5
North: Route 9 SB										
1 LT	0.645	8.6	9.3	17.9	0.0	13.3	1.7	11.6	4.2	17.9
2 TR	0.645	8.4	8.9	17.3	0.0	11.9	1.7	10.2	2.5	17.3
West: Route 67 EB										
1 L	0.730	9.7	14.6	24.2	0.0	19.8	2.4	17.4	8.4	24.2
2 TR	1.042	10.1	59.5	69.6	0.0	63.1	15.7	47.5	2.2	69.6

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

Geometric delay is less than 2 seconds for some movements. The negotiation speed may be too high or the approach and exit speeds may be too low for given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds, negotiation radius or negotiation speed data in the Path Data dialog.

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Lane Queues (Vehicles)
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (veh) Nb1	Nb2	Nb	95%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	95%
South: Route 9 NB											
1 LT	0.947	2.4	2.5	2.7	5.1	12.8	0.13	0.0	100.0	7.6	13.8
2 TR	0.947	2.5	2.6	2.8	5.4	13.4	0.14	0.0	100.0	7.9	14.4
East: Dunning Street WB											
1 L	0.626	0.3	1.2	0.2	1.5	3.6	0.26	0.0	100.0	1.7	3.1
2 TR	1.382	23.9	3.9	24.1	28.0	69.5	1.09	7.7	92.3	38.0	68.9
North: Route 9 SB											
1 LT	0.645	0.4	1.7	0.5	2.1	5.3	0.18	0.0	100.0	2.1	3.9
2 TR	0.645	0.4	1.7	0.5	2.2	5.4	0.19	0.0	100.0	2.2	3.9
West: Route 67 EB											
1 L	0.730	0.6	1.8	0.7	2.5	6.3	0.13	0.0	100.0	2.9	5.3

2 TR	1.042	7.2	3.4	8.1	11.5	28.6	0.59	0.0	100.0	14.1	25.6

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queues (Distance)
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	95%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	95%
South: Route 9 NB											
1 LT	0.947	60.8	62.7	66.8	129.6	322.1	0.13	0.0	100.0	192.4	349.0
2 TR	0.947	63.3	65.5	71.1	136.6	339.4	0.14	0.0	100.0	200.1	363.0
East: Dunning Street WB											
1 L	0.626	8.2	30.4	6.2	36.6	90.9	0.26	0.0	100.0	42.5	77.1
2 TR	1.382	599.9	96.9	606.4	703.3	1747.8	1.09	7.7	92.3	955.1	1732.6
North: Route 9 SB											
1 LT	0.645	10.1	42.1	11.7	53.7	133.6	0.18	0.0	100.0	54.0	97.9
2 TR	0.645	10.2	43.0	11.9	54.9	136.5	0.19	0.0	100.0	54.8	99.3
West: Route 67 EB											
1 L	0.730	14.7	46.0	17.1	63.0	156.7	0.13	0.0	100.0	73.5	133.3
2 TR	1.042	182.7	86.9	205.4	292.3	726.4	0.59	0.0	100.0	359.1	651.4

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (veh) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.947	5.1	6.7	9.4	10.9	12.8	14.2
2 TR	0.947	5.4	7.0	9.9	11.4	13.4	14.9
East: Dunning Street WB							
1 L	0.626	1.5	1.9	2.7	3.1	3.6	4.0
2 TR	1.382	28.0	36.2	51.1	59.1	69.5	77.2
North: Route 9 SB							
1 LT	0.645	2.1	2.8	3.9	4.5	5.3	5.9
2 TR	0.645	2.2	2.8	3.9	4.6	5.4	6.0
West: Route 67 EB							
1 L	0.730	2.5	3.3	4.6	5.3	6.3	6.9

2 TR	1.042	11.5	14.9	21.0	24.3	28.6	31.7

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Distance)
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.947	129.5	167.8	236.5	273.9	322.1	357.5
2 TR	0.947	136.5	176.8	249.3	288.6	339.4	376.7
East: Dunning Street WB							
1 L	0.626	36.6	47.4	66.8	77.3	90.9	100.9
2 TR	1.382	702.9	910.5	1283.6	1486.3	1747.8	1939.9
North: Route 9 SB							
1 LT	0.645	53.7	69.6	98.1	113.6	133.6	148.3
2 TR	0.645	54.9	71.1	100.2	116.1	136.5	151.5
West: Route 67 EB							
1 L	0.730	63.0	81.6	115.1	133.2	156.7	173.9
2 TR	1.042	292.1	378.4	533.5	617.7	726.4	806.3

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Stops
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.947	1.00	0.55	0.00	1.55	780.8	1.35	677.3	1.00
2 TR	0.947	1.00	0.56	0.00	1.56	862.2	1.34	739.0	1.00
East: Dunning Street WB									
1 L	0.626	0.89	0.14	0.07	1.10	179.1	0.39	63.5	0.89
2 TR	1.382	1.00	2.99	0.00	3.99	2615.5	7.21	4729.7	1.00
North: Route 9 SB									
1 LT	0.645	0.86	0.13	0.06	1.05	453.1	0.29	125.1	0.86
2 TR	0.645	0.86	0.13	0.04	1.03	462.7	0.29	127.7	0.86
West: Route 67 EB									
1 L	0.730	0.89	0.18	0.07	1.14	495.1	0.41	179.2	0.89
2 TR	1.042	1.00	1.18	0.00	2.18	1595.5	2.61	1909.0	1.00

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale Fixed	Flow Scale Var	Peak Flow Factor
South: Route 9 NB								
	South	3L	Left	1	0	1.00	1.00	0.93
	East	8R	Right	194	0	1.00	1.00	0.93
	North	8T	Thru	601	12	1.00	1.00	0.93
	West	3L	Left	247	0	1.00	1.00	0.93
East: Dunning Street WB								
	South	1L	Left	161	0	1.00	1.00	0.93
	East	1L	Left	1	0	1.00	1.00	0.93
	North	6R	Right	199	0	1.00	1.00	0.93
	West	6T	Thru	452	5	1.00	1.00	0.93
North: Route 9 SB								
	South	4T	Thru	453	9	1.00	1.00	0.93
	East	7L	Left	161	0	1.00	1.00	0.93
	North	7L	Left	1	0	1.00	1.00	0.93
	West	4R	Right	248	5	1.00	1.00	0.93
West: Route 67 EB								
	South	2R	Right	237	10	1.00	1.00	0.93
	East	2T	Thru	479	5	1.00	1.00	0.93
	North	5L	Left	387	0	1.00	1.00	0.93
	West	5L	Left	47	1	1.00	1.00	0.93

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

Go to Table Links (Top)

Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	248	0	0	0	0	0
8T T	0	0	601	12	0	0
8R R	0	0	0	0	194	0
East: Dunning Street WB						
1L L	162	0	0	0	0	0
6T T	0	0	452	5	0	0
6R R	0	0	0	0	199	0
North: Route 9 SB						
7L L	162	0	0	0	0	0
4T T	0	0	453	9	0	0

```
   4R R       0     0      0     0    248     5
-----------------------------------------------
West: Route 67 EB
   5L L     435     1      0     0      0     0
   2T T       0     0    479     5      0     0
   2R R       0     0      0     0    237    10
-----------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

```
Intersection ID: 1
Roundabout

---------------------------------------------------
  Mov          Left         Through        Right
  ID        ----------    ----------    ----------
            Total  %HV    Total  %HV    Total  %HV
---------------------------------------------------
Demand flows in veh/h as used by the program
South: Route 9 NB
   3L L      248   0.0       0   0.0       0   0.0
   8T T        0   0.0     613   2.0       0   0.0
   8R R        0   0.0       0   0.0     194   0.0
---------------------------------------------------
East: Dunning Street WB
   1L L      162   0.0       0   0.0       0   0.0
   6T T        0   0.0     457   1.0       0   0.0
   6R R        0   0.0       0   0.0     199   0.0
---------------------------------------------------
North: Route 9 SB
   7L L      162   0.1       0   0.0       0   0.0
   4T T        0   0.0     462   2.0       0   0.0
   4R R        0   0.0       0   0.0     253   2.0
---------------------------------------------------
West: Route 67 EB
   5L L      435   0.2       0   0.0       0   0.0
   2T T        0   0.0     484   1.0       0   0.0
   2R R        0   0.0       0   0.0     247   4.0
---------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (Customary)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  HCM Delay Model option used
  HCM Queue Model option used
```

```
Level of Service based on: Delay (HCM 2000)
Queue percentile: 95%
```

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Parameters Used in Cost Calculations
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

```
Intersection ID: 1
Roundabout


  Pump price of fuel ($/US gal)              =     2.400
  Fuel resource cost factor                  =      0.70
  Ratio of running cost to fuel cost         =       3.0
  Average income ($/h)                       =     19.00
  Time value factor                          =      0.40
  Light vehicle mass (1000 lb)               =       3.1
  Heavy vehicle mass (1000 lb)               =      24.0
  Light vehicle idle fuel rate (US gal/h)    =     0.360
  Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

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Diagnostics
Site:Route 9/Route 67/Dunning Street - PM Peak - No-Build 2022

```
Geometric delay is less than 2 seconds for some movements.  The negotiation
speed may be too high or the approach and exit speeds may be too low for
given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds,
negotiation radius or negotiation speed data in the Path Data dialog.
```

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Processed: Thursday, April 18, 2013 3:12:30 PM
SIDRA INTERSECTION 5.1.12.2089
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8000774, CREIGHTON MANNING ENGINEERING, SINGLE

DETAILED OUTPUT

Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Route 9/Route 67/Dunning Street
Build 2022
PM Peak Hour
Roundabout

OUTPUT TABLE LINKS

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- Roundabout Basic Parameters
- Roundabout Gap Acceptance Parameters
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Movements
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- Fuel Consumption, Emissions and Cost (Rate)
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Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

```
Intersection ID: 1
Roundabout

-------------------------------------------------------------------------------
                                                Circulating/Exiting Stream
 Cent  Circ  Insc  Ent Ent Cir Ent Av.Ent ------------------------------------
Island Width Diam. Rad Ang Lan Lan Lane   Flow %HV Adjust. %Exit  Cap.    O-D
 Diam                               Width            Flow   Incl. Constr. Factor
  ft    ft    ft   ft  deg          ft   veh/h      pcu/h        Effect
-------------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
```

```
 105    33   171  100  30   2   2  13.00 1042  0.5  1047     0     Y     0.760
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00 1395  1.0  1409     0     Y     0.705
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  837  0.5   841     0     Y     0.863
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  810  1.2   819     0     Y     0.842
-----------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

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Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
Turn Lane    Lane    ---- Circulating/Exiting Stream ---   Critical Gap
      No.    Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                      Rate  Speed   Dist Headway Bunched   Hdwy    Dist  Headway
                     pcu/h  mph     ft    sec              sec     ft     sec
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant 1047   20.0   100.6  1.20   0.540    3.55   103.8    2.53
Thru  1 Subdominant 1047   20.0   100.6  1.20   0.540    3.62   105.9    2.58
      2 Dominant    1047   20.0   100.6  1.20   0.540    3.40    99.6    2.42
Right 2 Dominant    1047   20.0   100.6  1.20   0.540    3.34    97.6    2.37
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant 1409   20.3    75.9  1.38   0.720    4.41   131.1    3.26
Thru  2 Dominant    1409   20.3    75.9  1.38   0.720    3.07    91.1    2.26
Right 2 Dominant    1409   20.3    75.9  1.38   0.720    3.04    90.2    2.24
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  841   19.5   122.3  1.64   0.577    3.69   105.4    2.56
Thru  1 Subdominant  841   19.5   122.3  1.64   0.577    3.76   107.4    2.60
      2 Dominant     841   19.5   122.3  1.64   0.577    3.61   103.2    2.50
Right 2 Dominant     841   19.5   122.3  1.64   0.577    3.61   103.2    2.50
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  819   21.4   138.1  1.40   0.508    4.10   129.1    2.83
Thru  2 Dominant     819   21.4   138.1  1.40   0.508    3.60   113.2    2.48
Right 2 Dominant     819   21.4   138.1  1.40   0.508    3.71   116.5    2.56
-----------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

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Roundabout Pedestrian Effects
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

```
Intersection ID: 1
```

Roundabout

ROUNDABOUT ENTRY

Turn	Pedestrian Flow Rate	Circulating Flow Rate	Adjustment Factor
South: Route 9 NB			
Left	1	1047	1.000
Thru	1	1047	1.000
Right	1	1047	1.000
East: Dunning Street WB			
Left	1	1409	1.000
Thru	1	1409	1.000
Right	1	1409	1.000
North: Route 9 SB			
Left	1	841	1.000
Thru	1	841	1.000
Right	1	841	1.000
West: Route 67 EB			
Left	1	819	1.000
Thru	1	819	1.000
Right	1	819	1.000

ROUNDABOUT EXIT

Pedestrian Flow Rate (ped/h)	Conflict Zone Length (ft)	Critical Gap (sec)	Follow-up Headway (sec)	Exit Lane Capacity (veh/h)	Total Exit Flow (veh/h)	Average Exit Flow (veh/h/lane)

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Movements

Movement Capacity Parameters
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Movement Flow veh/h	HV %	Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	356	0.0	1042	0.5	1047	317	0.85	-24	100	1.123
8T T	720	2.0	1042	0.5	1047	642	0.85	-24	100	1.123
8R R	194	0.0	1042	0.5	1047	172	0.85	-24	100	1.123
East: Dunning Street WB										
1L L	162	0.0	1395	1.0	1409	242	0.85	27	100	0.670
6T T	489	1.0	1395	1.0	1409	309	0.85	-46	100	1.584*
6R R	210	0.0	1395	1.0	1409	132	0.85	-46	100	1.584*
North: Route 9 SB										
7L L	162	0.1	837	0.5	841	237	0.85	24	100	0.686
4T T	484	2.0	837	0.5	841	705	0.85	24	100	0.686
4R R	253	2.0	837	0.5	841	368	0.85	24	100	0.686
West: Route 67 EB										
5L L	435	0.2	810	1.2	819	575	0.85	12	100	0.757

2T	T	489	1.0	810	1.2	819	443	0.85	-23	100	1.105
2R	R	269	4.0	810	1.2	819	243	0.85	-23	100	1.105

* Maximum degree of saturation

Go to Table Links (Top)

Movement Performance
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID		Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB										
3L	L	10.23	12.27	103.5	2.63	937.4	27.57	126.2	15.1	8.3
8T	T	20.36	24.43	101.7	2.68	1929.1	54.66	231.1	28.6	8.1
8R	R	5.42	6.50	100.8	2.72	526.3	14.64	61.8	7.6	8.1
East: Dunning Street WB										
1L	L	1.98	2.38	44.0	1.13	184.0	6.68	62.2	4.4	14.0
6T	T	40.30	48.36	296.5	4.65	2275.6	85.00	170.8	46.3	3.7
6R	R	17.27	20.73	296.5	4.66	977.9	36.43	72.9	19.8	3.7
North: Route 9 SB										
7L	L	0.92	1.11	20.4	1.16	187.8	4.05	35.3	2.4	14.7
4T	T	2.70	3.25	20.1	1.08	524.7	11.24	88.8	6.0	14.8
4R	R	1.38	1.66	19.7	1.10	279.1	5.83	46.0	3.1	14.9
West: Route 67 EB										
5L	L	3.26	3.91	26.9	1.17	508.0	13.34	136.7	8.8	15.5
2T	T	12.25	14.70	90.2	2.69	1315.0	34.21	136.1	17.1	8.0
2R	R	6.73	8.08	90.2	2.67	717.8	18.76	74.3	9.4	7.9

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID		Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB							
3L	L	190.47	9.9	93.5	5.48	0.184	0.154
8T	T	362.26	19.6	185.2	11.48	0.358	0.322
8R	R	96.07	5.0	47.8	2.93	0.095	0.081
		648.80	34.5	326.5	19.90	0.637	0.556
East: Dunning Street WB							
1L	L	57.47	3.4	32.0	1.90	0.058	0.056
6T	T	549.31	24.2	229.1	11.06	0.483	0.312
6R	R	234.98	10.2	96.8	4.62	0.206	0.130
		841.77	37.8	357.9	17.57	0.748	0.497
North: Route 9 SB							
7L	L	33.51	2.2	20.6	1.56	0.038	0.042
4T	T	84.21	5.9	55.8	4.54	0.101	0.123
4R	R	44.42	3.1	29.4	2.42	0.053	0.065
		162.14	11.2	105.9	8.53	0.193	0.231

West: Route 67 EB						
5L L	118.57	7.5	70.9	4.78	0.128	0.135
2T T	218.36	11.9	112.8	7.50	0.222	0.203
2R R	123.14	7.0	66.1	4.48	0.126	0.124
	460.07	26.4	249.8	16.76	0.476	0.462
INTERSECTION:	2112.77	109.8	1040.0	62.76	2.053	1.746

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Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.94	12.8	460.5	26.99	0.906	0.756
8T T	0.97	11.8	498.0	30.87	0.963	0.865
8R R	0.97	12.2	480.6	29.51	0.953	0.815
	0.96	12.2	484.1	29.50	0.944	0.825
East: Dunning Street WB						
1L L	0.57	18.4	319.7	18.98	0.581	0.561
6T T	2.00	7.1	833.4	40.22	1.758	1.134
6R R	2.00	7.1	825.0	39.35	1.759	1.104
	1.71	8.1	727.0	35.69	1.519	1.011
North: Route 9 SB						
7L L	0.59	16.2	362.8	27.56	0.672	0.743
4T T	0.59	15.1	390.9	31.80	0.707	0.863
4R R	0.60	14.8	397.9	32.69	0.723	0.883
	0.59	15.2	387.0	31.16	0.704	0.843
West: Route 67 EB						
5L L	0.54	18.3	322.1	21.74	0.581	0.615
2T T	1.00	11.4	515.0	34.24	1.014	0.927
2R R	1.03	10.7	552.6	37.47	1.055	1.033
	0.82	13.2	447.1	30.01	0.852	0.827
INTERSECTION:	1.06	11.3	520.3	31.40	1.027	0.874

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Intersection Negotiation Data
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?
South: Route 9 NB								
	South	Left	65.7	16.3	361.2	1450	394	No
	East	Right	123.3	20.7	66.2	1450	204	No
	North	Thru	200.1	24.9	161.6	1450	262	No

	West	Left	65.7	16.3	258.0	1450	394	No
East: Dunning Street WB								
	South	Left	65.7	16.3	258.0	1600	422	No
	East	Left	65.7	16.3	361.2	1600	422	No
	North	Right	123.3	20.7	66.2	1600	204	No
	West	Thru	200.1	24.9	161.6	1600	261	No
North: Route 9 SB								
	South	Thru	200.1	24.9	161.6	725	274	No
	East	Left	65.7	16.3	258.0	725	377	No
	North	Left	65.7	16.3	361.2	725	377	No
	West	Right	123.3	20.7	66.2	725	219	No
West: Route 67 EB								
	South	Right	123.3	20.7	66.2	1225	213	No
	East	Thru	200.1	24.9	161.6	1225	263	No
	North	Left	65.7	16.3	258.0	1225	433	No
	West	Left	65.7	16.3	361.2	1225	433	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

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Movement Speeds and Geometric Delay
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	30.0	16.3	16.3	30.0	10.4		16.9	8.3	8.2
8T T	30.0	24.9	24.9	30.0	10.5		16.3	8.1	1.7
8R R	30.0	20.7	20.7	30.0	10.7		16.5	8.1	3.1
East: Dunning Street WB									
1L L	30.0	16.3	16.3	30.0	8.9		22.6	14.0	8.2
6T T	30.0	24.9	24.9	30.0	10.3		12.5	3.7	1.7
6R R	30.0	20.7	20.7	30.0	10.3		12.5	3.7	3.1
North: Route 9 SB									
7L L	30.0	16.3	16.3	30.0	11.5		20.7	14.7	8.2
4T T	30.0	24.9	24.9	30.0	11.5		20.1	14.8	1.7
4R R	30.0	20.7	20.7	30.0	11.6		20.5	14.9	3.1
West: Route 67 EB									
5L L	30.0	16.3	16.3	30.0	10.8		21.2	15.5	8.4
2T T	30.0	24.9	24.9	30.0	11.5		15.5	8.0	1.7
2R R	30.0	20.7	20.7	30.0	11.4		15.7	7.9	3.2

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

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Lanes

Lane Performance

Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 95% Back veh	Queue 95% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	608	542	1.123	103.5	2.63	33.7	847.7	2500.0
2 TR	662	589	1.123	100.8	2.71	36.0	911.4	2500.0
East: Dunning Street WB								
1 L	162	242	0.670	44.0	1.13	4.0	99.6	350.0
2 TR	699	441	1.584	296.5	4.66	93.6	2353.0	1600.0
North: Route 9 SB								
1 LT	439	640	0.686	20.4	1.11	6.1	153.4	725.0
2 TR	460	671	0.686	19.7	1.10	6.2	157.4	725.0
West: Route 67 EB								
1 L	435	575	0.757	26.9	1.17	6.7	168.2	1225.0
2 TR	758	686	1.105	90.2	2.68	39.0	990.1	1225.0

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Lane Flow and Capacity Information
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	356	252	0	608	150	542	1.123	100
2 TR	0	468	194	662	150	589	1.123	100
East: Dunning Street WB								
1 L	162	0	0	162	150	242	0.670	100
2 TR	0	489	210	699	150	441	1.584	100
North: Route 9 SB								
1 LT	162	276	0	439	150	640	0.686	100
2 TR	0	207	253	460	150	671	0.686	100
West: Route 67 EB								
1 L	435	0	0	435	150	575	0.757	100
2 TR	0	489	269	758	150	686	1.105	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

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Lane, Approach and Intersection Performance
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane	Demand Flow (veh/h)	Adj.	Eff Grn	Deg	Aver.	Longest	Shrt

No.	L	T	R	Tot	%HV	Basic Satf.	(sec) 1st	(sec) 2nd	Sat x	Delay sec	Queue ft	Lane ft
South: Route 9 NB												
1 LT	356	252		608	1				1.123	103.5	848	2500
2 TR		468	194	662	1				1.123	100.8	911	2500
	356	720	194	1270	1				1.123	102.1	911	
East: Dunning Street WB												
1 L	162			162	0				0.670	44.0	100	350
2 TR		489	210	699	1				1.584	296.5	2353	1600
	162	489	210	861	1				1.584	248.9	2353	
North: Route 9 SB												
1 LT	162	276		439	1				0.686	20.4	153	725
2 TR		207	253	460	2				0.686	19.7	157	725
	162	484	253	899	2				0.686	20.1	157	
West: Route 67 EB												
1 L	435			435	0				0.757	26.9	168	1225
2 TR		489	269	758	2				1.105	90.2	990	1225
	435	489	269	1194	1				1.105	67.1	990	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	4224	1	1.584	104.7	2353

Peak flow period = 15 minutes.

Queue values in this table are 95% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

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Driver Characteristics
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec
South: Route 9 NB						
1 LT	19.9	1414	2.55	74.21	25.17	1.68
2 TR	23.7	1495	2.41	83.59	25.28	1.68
East: Dunning Street WB						
1 L	16.3	1106	3.26	77.90	25.00	2.21
2 TR	23.6	1596	2.26	78.16	25.14	1.53
North: Route 9 SB						
1 LT	21.7	1392	2.59	82.36	25.26	1.79
2 TR	22.6	1439	2.50	82.88	25.40	1.73
West: Route 67 EB						
1 L	16.3	1270	2.83	67.82	25.04	1.79
2 TR	23.4	1434	2.51	86.19	25.41	1.77

Saturation Flow and Saturation Headway are derived from follow-up headway.

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Lane Delays

Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
South: Route 9 NB										
1 LT	1.123	11.6	91.8	103.5	0.0	98.6	22.3	76.3	5.5	103.5
2 TR	1.123	11.1	89.7	100.8	0.0	94.3	23.2	71.0	2.1	100.8
East: Dunning Street WB										
1 L	0.670	18.2	25.8	44.0	0.0	39.4	2.3	37.1	8.2	44.0
2 TR	1.584	13.2	283.4	296.5	0.0	290.0	50.2	239.9	2.2	296.5
North: Route 9 SB										
1 LT	0.686	9.1	11.4	20.4	0.0	15.7	2.3	13.4	4.1	20.4
2 TR	0.686	8.8	10.9	19.7	0.0	14.1	2.2	11.8	2.5	19.7
West: Route 67 EB										
1 L	0.757	10.0	16.9	26.9	0.0	22.4	2.7	19.7	8.4	26.9
2 TR	1.105	10.2	79.9	90.2	0.0	83.7	22.3	61.4	2.2	90.2

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

Geometric delay is less than 2 seconds for some movements. The negotiation speed may be too high or the approach and exit speeds may be too low for given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds, negotiation radius or negotiation speed data in the Path Data dialog.

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Lane Queues (Vehicles)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (veh) Nb1	Nb2	Nb	95%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	95%
South: Route 9 NB											
1 LT	1.123	10.1	3.1	10.5	13.6	33.7	0.34	0.0	100.0	17.5	31.7
2 TR	1.123	10.9	3.2	11.3	14.5	36.0	0.36	0.0	100.0	18.5	33.6
East: Dunning Street WB											
1 L	0.670	0.4	1.3	0.3	1.6	4.0	0.28	0.0	100.0	2.0	3.6
2 TR	1.584	33.1	4.3	33.4	37.7	93.6	1.47	17.9	82.1	57.6	104.4
North: Route 9 SB											
1 LT	0.686	0.5	1.8	0.6	2.4	6.1	0.21	0.0	100.0	2.5	4.5
2 TR	0.686	0.6	1.8	0.6	2.5	6.2	0.22	0.0	100.0	2.5	4.6
West: Route 67 EB											
1 L	0.757	0.7	1.9	0.8	2.7	6.7	0.14	0.0	100.0	3.3	5.9

2 TR	1.105	11.3	3.6	12.1	15.7	39.0	0.81	0.0	100.0	19.0	34.4

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queues (Distance)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	95%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	95%
South: Route 9 NB											
1 LT	1.123	254.8	77.3	263.8	341.1	847.7	0.34	0.0	100.0	439.9	798.0
2 TR	1.123	275.6	80.6	286.1	366.7	911.4	0.36	0.0	100.0	468.3	849.5
East: Dunning Street WB											
1 L	0.670	10.1	32.5	7.5	40.1	99.6	0.28	0.0	100.0	49.6	89.9
2 TR	1.584	833.2	108.2	838.6	946.7	2353.0	1.47	17.9	82.1	1447.3	2625.5
North: Route 9 SB											
1 LT	0.686	13.8	45.8	15.9	61.7	153.4	0.21	0.0	100.0	62.9	114.2
2 TR	0.686	14.0	47.0	16.4	63.3	157.4	0.22	0.0	100.0	63.9	116.0
West: Route 67 EB											
1 L	0.757	17.0	48.0	19.7	67.7	168.2	0.14	0.0	100.0	81.6	148.0
2 TR	1.105	287.8	90.9	307.5	398.4	990.1	0.81	0.0	100.0	482.5	875.3

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (veh) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	1.123	13.5	17.5	24.7	28.6	33.7	37.4
2 TR	1.123	14.5	18.8	26.5	30.7	36.0	40.0
East: Dunning Street WB							
1 L	0.670	1.6	2.1	2.9	3.4	4.0	4.4
2 TR	1.584	37.6	48.8	68.7	79.6	93.6	103.9
North: Route 9 SB							
1 LT	0.686	2.4	3.2	4.5	5.2	6.1	6.7
2 TR	0.686	2.5	3.2	4.6	5.3	6.2	6.9
West: Route 67 EB							
1 L	0.757	2.7	3.5	4.9	5.7	6.7	7.5

2 TR	1.105	15.7	20.3	28.6	33.1	39.0	43.2

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Distance)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	1.123	340.9	441.6	622.5	720.8	847.7	940.9
2 TR	1.123	366.5	474.8	669.3	775.0	911.4	1011.6
East: Dunning Street WB							
1 L	0.670	40.1	51.9	73.1	84.7	99.6	110.6
2 TR	1.584	946.3	1225.8	1728.0	2000.9	2353.0	2611.6
North: Route 9 SB							
1 LT	0.686	61.7	79.9	112.6	130.4	153.4	170.2
2 TR	0.686	63.3	82.0	115.6	133.8	157.4	174.7
West: Route 67 EB							
1 L	0.757	67.6	87.6	123.5	143.0	168.2	186.7
2 TR	1.105	398.2	515.8	727.1	841.9	990.1	1098.9

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Stops
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	1.123	1.00	1.63	0.00	2.63	1599.3	3.95	2401.3	1.00
2 TR	1.123	1.00	1.71	0.00	2.71	1793.5	4.06	2685.5	1.00
East: Dunning Street WB									
1 L	0.670	0.92	0.17	0.05	1.13	184.0	0.46	74.2	0.92
2 TR	1.584	1.00	3.66	0.00	4.66	3253.5	8.94	6247.8	1.00
North: Route 9 SB									
1 LT	0.686	0.89	0.17	0.05	1.11	487.3	0.38	167.0	0.89
2 TR	0.686	0.90	0.17	0.03	1.10	504.3	0.37	172.0	0.90
West: Route 67 EB									
1 L	0.757	0.91	0.20	0.06	1.17	508.0	0.47	204.2	0.91
2 TR	1.105	1.00	1.68	0.00	2.68	2032.9	3.74	2834.5	1.00

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale Fixed	Flow Scale Var	Peak Flow Factor
South: Route 9 NB								
	South	3L	Left	1	0	1.00	1.00	0.93
	East	8R	Right	194	0	1.00	1.00	0.93
	North	8T	Thru	706	14	1.00	1.00	0.93
	West	3L	Left	355	0	1.00	1.00	0.93
East: Dunning Street WB								
	South	1L	Left	161	0	1.00	1.00	0.93
	East	1L	Left	1	0	1.00	1.00	0.93
	North	6R	Right	210	0	1.00	1.00	0.93
	West	6T	Thru	484	5	1.00	1.00	0.93
North: Route 9 SB								
	South	4T	Thru	474	10	1.00	1.00	0.93
	East	7L	Left	161	0	1.00	1.00	0.93
	North	7L	Left	1	0	1.00	1.00	0.93
	West	4R	Right	248	5	1.00	1.00	0.93
West: Route 67 EB								
	South	2R	Right	258	11	1.00	1.00	0.93
	East	2T	Thru	484	5	1.00	1.00	0.93
	North	5L	Left	387	0	1.00	1.00	0.93
	West	5L	Left	47	1	1.00	1.00	0.93

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

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Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	356	0	0	0	0	0
8T T	0	0	706	14	0	0
8R R	0	0	0	0	194	0
East: Dunning Street WB						
1L L	162	0	0	0	0	0
6T T	0	0	484	5	0	0
6R R	0	0	0	0	210	0
North: Route 9 SB						
7L L	162	0	0	0	0	0
4T T	0	0	474	10	0	0

```
   4R R       0      0      0      0    248      5
-----------------------------------------------
West: Route 67 EB
   5L L     435      1      0      0      0      0
   2T T       0      0    484      5      0      0
   2R R       0      0      0      0    258     11
-----------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

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Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

```
Intersection ID: 1
Roundabout

---------------------------------------------------
  Mov          Left         Through        Right
  ID        ----------    ----------    ----------
            Total  %HV    Total  %HV    Total  %HV
---------------------------------------------------
Demand flows in veh/h as used by the program
South: Route 9 NB
   3L L      356   0.0       0   0.0       0   0.0
   8T T        0   0.0     720   2.0       0   0.0
   8R R        0   0.0       0   0.0     194   0.0
---------------------------------------------------
East: Dunning Street WB
   1L L      162   0.0       0   0.0       0   0.0
   6T T        0   0.0     489   1.0       0   0.0
   6R R        0   0.0       0   0.0     210   0.0
---------------------------------------------------
North: Route 9 SB
   7L L      162   0.1       0   0.0       0   0.0
   4T T        0   0.0     484   2.0       0   0.0
   4R R        0   0.0       0   0.0     253   2.0
---------------------------------------------------
West: Route 67 EB
   5L L      435   0.2       0   0.0       0   0.0
   2T T        0   0.0     489   1.0       0   0.0
   2R R        0   0.0       0   0.0     269   4.0
---------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

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Other

Model Settings
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (Customary)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  HCM Delay Model option used
  HCM Queue Model option used
```

```
Level of Service based on: Delay (HCM 2000)
Queue percentile: 95%
```

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Parameters Used in Cost Calculations
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

```
Intersection ID: 1
Roundabout


  Pump price of fuel ($/US gal)              =     2.400
  Fuel resource cost factor                  =      0.70
  Ratio of running cost to fuel cost         =       3.0
  Average income ($/h)                       =     19.00
  Time value factor                          =      0.40
  Light vehicle mass (1000 lb)               =       3.1
  Heavy vehicle mass (1000 lb)               =      24.0
  Light vehicle idle fuel rate (US gal/h)    =     0.360
  Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

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Diagnostics
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022

```
Geometric delay is less than 2 seconds for some movements.  The negotiation
speed may be too high or the approach and exit speeds may be too low for
given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds,
negotiation radius or negotiation speed data in the Path Data dialog.
```

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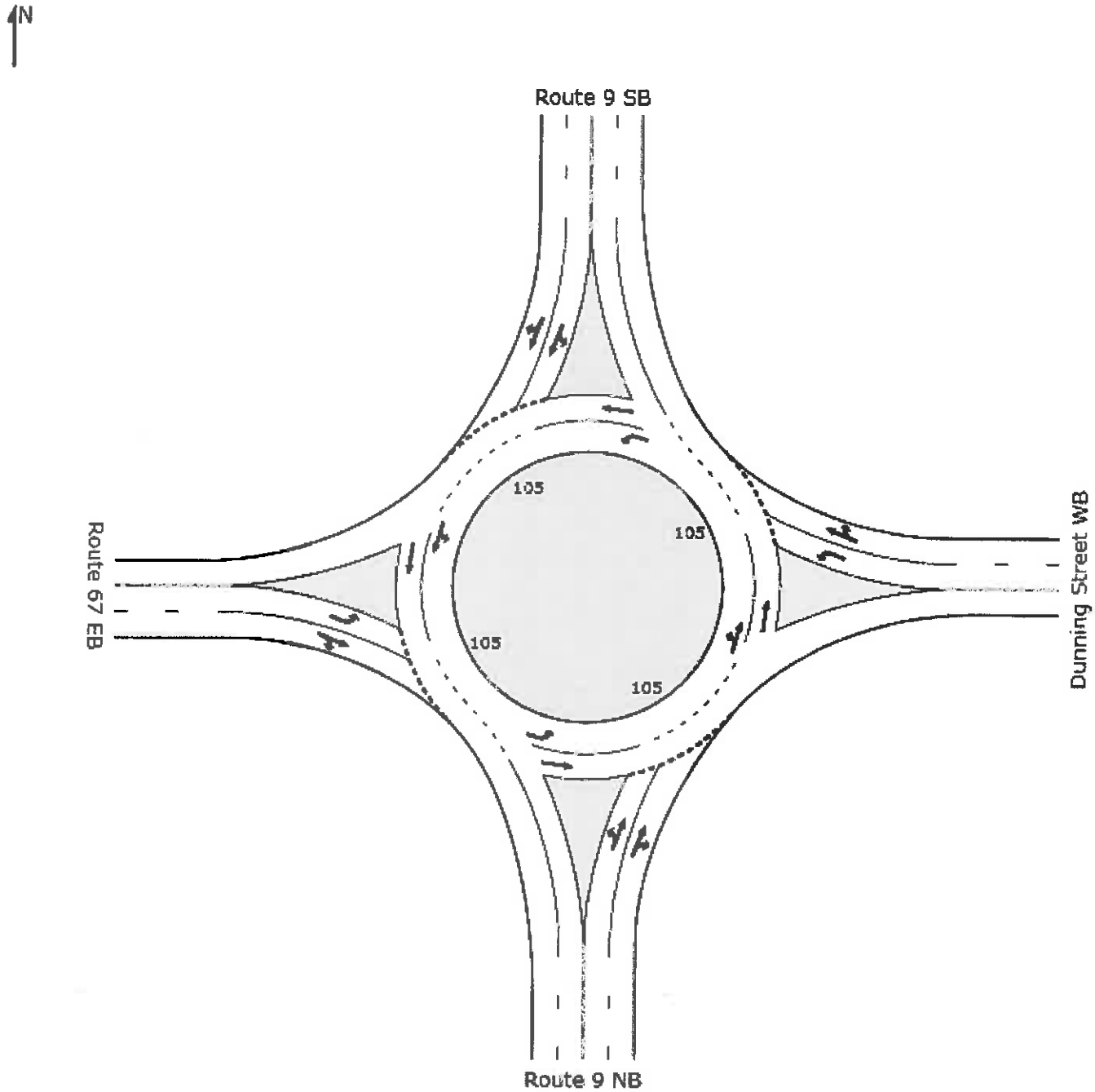
N
Route 9 SB
Route 67 EB
Dunning Street WB
Route 9 NB
105
105
105
105

DETAILED OUTPUT

Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Route 9/Route 67/Dunning Street
Build 2022
PM Peak Hour
Roundabout

OUTPUT TABLE LINKS

Roundabouts
- Roundabout Basic Parameters
- Roundabout Gap Acceptance Parameters
- Roundabout Pedestrian Effects

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- Movement Capacity Parameters
- Movement Performance
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- Lane Queues (Distance)
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- Lane Queue Percentiles (Distance)
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Flow Rates and Demand Analysis
- Movement Definitions and Flow Rates (O-D)
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- Flow Rates (Total Vehicles and Percent Heavy)

Other
- Model Settings
- Parameters Used in Cost Calculations
- Diagnostics

Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

```
Intersection ID: 1
Roundabout

-------------------------------------------------------------------------------
                                                Circulating/Exiting Stream
 Cent  Circ  Insc  Ent Ent Cir Ent Av.Ent ------------------------------------
Island Width Diam. Rad Ang Lan Lan Lane   Flow %HV Adjust. %Exit  Cap.    O-D
 Diam                              Width            Flow   Incl. Constr. Factor
  ft    ft    ft   ft  deg          ft   veh/h      pcu/h        Effect
-------------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
```

```
 105    33   171  100  30   2   3  13.00 1088  0.5  1094     0     N     0.733
   Exclusive Slip lane (exiting flow):  652   0.8    657     0     N    0.874
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   3  13.00 1513  1.0  1528     0     N     0.680
   Exclusive Slip lane (exiting flow): 1109   1.3   1123     0     N    0.773
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00 1056  0.6  1062     0     N     0.800
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 105    33   171  100  30   2   2  13.00  810  1.2   819     0     N     0.830
-----------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

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Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
Turn Lane    Lane    ---- Circulating/Exiting Stream ---   Critical Gap
     No.     Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                      Rate  Speed   Dist Headway Bunched   Hdwy    Dist  Headway
                     pcu/h  mph     ft    sec              sec     ft     sec
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant 1094   20.2    97.3  1.32   0.596    3.20    94.7    2.29
Thru  1 Subdominant 1094   20.2    97.3  1.32   0.596    3.26    96.6    2.34
      2 Dominant    1094   20.2    97.3  1.32   0.596    2.74    81.0    1.96
Right 3 Excl. Slip   657E  22.7   182.9  1.45   0.441    3.10   103.4    2.08
-----------------------------------------------------------------------------
East: Dunning Street WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant 1528   20.4    70.5  1.35   0.748    2.95    88.1    2.19
Thru  1 Subdominant 1528   20.4    70.5  1.35   0.748    2.98    89.0    2.21
      2 Dominant    1528   20.4    70.5  1.35   0.748    2.39    71.5    1.78
Right 3 Excl. Slip  1123E  21.9   102.9  1.66   0.702    2.66    85.3    1.91
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant 1062   20.3   100.9  1.46   0.623    3.54   105.2    2.52
Thru  1 Subdominant 1062   20.3   100.9  1.46   0.623    3.61   107.3    2.57
      2 Dominant    1062   20.3   100.9  1.46   0.623    3.39   100.8    2.42
Right 2 Dominant    1062   20.3   100.9  1.46   0.623    3.39   100.8    2.42
-----------------------------------------------------------------------------
West: Route 67 EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  819   21.4   138.1  1.39   0.505    3.70   116.3    2.55
Thru  1 Subdominant  819   21.4   138.1  1.39   0.505    3.73   117.2    2.57
      2 Dominant     819   21.4   138.1  1.39   0.505    3.60   113.1    2.48
Right 2 Dominant     819   21.4   138.1  1.39   0.505    3.71   116.5    2.56
-----------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.
  E  Exiting flow for slip lane traffic

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

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Roundabout Pedestrian Effects
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

ROUNDABOUT ENTRY

Turn	Pedestrian Flow Rate	Circulating Flow Rate	Adjustment Factor
South: Route 9 NB			
Left	1	1094	1.000
Thru	1	1094	1.000
Right	1	657	1.000
East: Dunning Street WB			
Left	1	1528	1.000
Thru	1	1528	1.000
Right	1	1123	1.000
North: Route 9 SB			
Left	1	1062	1.000
Thru	1	1062	1.000
Right	1	1062	1.000
West: Route 67 EB			
Left	1	819	1.000
Thru	1	819	1.000
Right	1	819	1.000

ROUNDABOUT EXIT

Pedestrian Flow Rate (ped/h)	Conflict Zone Length (ft)	Critical Gap (sec)	Follow-up Headway (sec)	Exit Lane Capacity (veh/h)	Total Exit Flow (veh/h)	Average Exit Flow (veh/h/lane)

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Movements

Movement Capacity Parameters
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Movement Flow veh/h	HV %	Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	356	0.0	1088	0.5	1094	430	0.85	3	100	0.828
8T T	720	2.0	1088	0.5	1094	870	0.85	3	100	0.828
8R R	194	0.0	652	0.8	657	1011	0.85	344	100	0.192
East: Dunning Street WB										
1L L	162	0.0	1513	1.0	1528	238	0.85	25	100	0.681
6T T	489	1.0	1513	1.0	1528	718	0.85	25	100	0.681
6R R	210	0.0	1109	1.3	1123	687	0.85	179	100	0.305
North: Route 9 SB										
7L L	162	0.1	1056	0.6	1062	200	0.85	5	100	0.812

4T	T	484	2.0	1056	0.6	1062	596	0.85	5	100	0.812
4R	R	253	2.0	1056	0.6	1062	311	0.85	5	100	0.812
West: Route 67 EB											
5L	L	435	0.2	810	1.2	819	487	0.85	-5	100	0.894*
2T	T	489	1.0	810	1.2	819	547	0.85	-5	100	0.894*
2R	R	269	4.0	810	1.2	819	301	0.85	-5	100	0.894*

* Maximum degree of saturation

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Movement Performance
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID		Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB										
3L	L	3.32	3.99	33.6	1.28	455.8	12.62	126.2	8.3	15.2
8T	T	5.84	7.01	29.2	1.29	926.2	23.40	231.1	14.0	16.6
8R	R	0.29	0.35	5.4	0.64	123.1	3.45	61.8	2.5	24.8
East: Dunning Street WB										
1L	L	1.32	1.59	29.3	1.18	192.1	5.72	62.2	3.7	16.7
6T	T	3.29	3.95	24.2	1.19	583.3	15.61	170.8	9.3	18.4
6R	R	0.53	0.63	9.0	0.87	182.8	4.80	72.9	3.1	23.4
North: Route 9 SB										
7L	L	1.52	1.83	33.8	1.30	210.7	5.10	35.3	3.0	11.8
4T	T	4.42	5.31	32.9	1.27	615.7	14.41	88.8	7.7	11.5
4R	R	2.23	2.68	31.8	1.28	324.4	7.41	46.0	3.9	11.7
West: Route 67 EB										
5L	L	4.68	5.62	38.7	1.40	611.7	16.20	136.7	10.2	13.4
2T	T	5.20	6.24	38.3	1.41	688.4	17.53	136.1	10.1	13.4
2R	R	2.84	3.41	38.1	1.40	377.5	9.59	74.3	5.5	13.5

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID		Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB							
3L	L	110.67	6.8	64.5	4.14	0.117	0.120
8T	T	193.08	12.9	122.6	8.54	0.215	0.245
8R	R	35.95	2.6	24.8	1.67	0.041	0.050
		339.70	22.4	211.9	14.35	0.373	0.415
East: Dunning Street WB							
1L	L	50.29	3.2	29.8	1.88	0.053	0.055
6T	T	128.41	8.7	82.3	5.59	0.143	0.163
6R	R	44.59	3.2	30.4	2.08	0.051	0.062
		223.29	15.1	142.5	9.54	0.247	0.280
North: Route 9 SB							

7L L	40.32	2.4	23.0	1.65	0.044	0.045
4T T	104.14	6.7	63.4	4.94	0.118	0.133
4R R	54.21	3.5	33.1	2.60	0.062	0.070
	198.68	12.6	119.5	9.19	0.224	0.248
West: Route 67 EB						
5L L	135.19	8.2	77.2	5.11	0.142	0.144
2T T	134.66	8.5	80.1	5.59	0.147	0.157
2R R	76.37	5.0	47.3	3.36	0.084	0.095
	346.22	21.6	204.6	14.06	0.373	0.396
INTERSECTION:	1107.88	71.7	678.5	47.14	1.217	1.339

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.55	18.5	317.6	20.40	0.574	0.589
8T T	0.52	17.8	329.7	22.97	0.578	0.659
8R R	0.36	23.6	249.3	16.76	0.414	0.505
	0.50	18.7	314.2	21.28	0.553	0.615
East: Dunning Street WB						
1L L	0.50	19.7	298.2	18.74	0.529	0.552
6T T	0.47	19.7	299.3	20.34	0.521	0.592
6R R	0.38	22.7	259.0	17.71	0.437	0.526
	0.45	20.3	289.5	19.39	0.502	0.568
North: Route 9 SB						
7L L	0.71	14.5	404.8	29.16	0.770	0.786
4T T	0.73	13.3	444.1	34.55	0.829	0.933
4R R	0.73	13.1	447.7	35.14	0.838	0.946
	0.73	13.5	436.9	33.59	0.819	0.906
West: Route 67 EB						
5L L	0.61	16.8	350.9	23.21	0.647	0.654
2T T	0.61	16.1	365.7	25.53	0.670	0.716
2R R	0.64	14.9	395.3	28.07	0.701	0.798
	0.62	16.1	366.2	25.16	0.668	0.709
INTERSECTION:	0.55	17.3	339.4	23.58	0.609	0.670

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Intersection Negotiation Data
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?

South: Route 9 NB								
	South	Left	65.7	16.3	361.2	1450	406	No
	East	Right	143.1	21.9	66.0	1450	236	No
	North	Thru	200.1	24.9	161.6	1450	247	No
	West	Left	65.7	16.3	258.0	1450	406	No
East: Dunning Street WB								
	South	Left	65.7	16.3	258.0	1600	395	No
	East	Left	65.7	16.3	361.2	1600	395	No
	North	Right	143.1	21.9	66.0	1600	236	No
	West	Thru	200.1	24.9	161.6	1600	245	No
North: Route 9 SB								
	South	Thru	200.1	24.9	161.6	725	274	No
	East	Left	65.7	16.3	258.0	725	378	No
	North	Left	65.7	16.3	361.2	725	378	No
	West	Right	123.3	20.7	66.2	725	219	No
West: Route 67 EB								
	South	Right	123.3	20.7	66.2	1225	217	No
	East	Thru	200.1	24.9	161.6	1225	268	No
	North	Left	65.7	16.3	258.0	1225	417	No
	West	Left	65.7	16.3	361.2	1225	417	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

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Movement Speeds and Geometric Delay
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	30.0	16.3	16.3	30.0	10.8		22.0	15.2	8.2
8T T	30.0	24.9	24.9	30.0	11.4		22.6	16.6	1.7
8R R	30.0	21.9	21.9	30.0			25.6	24.8	2.7
East: Dunning Street WB									
1L L	30.0	16.3	16.3	30.0	10.1		23.3	16.7	8.2
6T T	30.0	24.9	24.9	30.0	10.8		23.5	18.4	1.7
6R R	30.0	21.9	21.9	30.0			25.1	23.4	2.7
North: Route 9 SB									
7L L	30.0	16.3	16.3	30.0	10.7		19.7	11.8	8.2
4T T	30.0	24.9	24.9	30.0	10.7		18.7	11.5	1.7
4R R	30.0	20.7	20.7	30.0	10.9		19.2	11.7	3.1
West: Route 67 EB									
5L L	30.0	16.3	16.3	30.0	11.3		20.6	13.4	8.4
2T T	30.0	24.9	24.9	30.0	11.4		20.7	13.4	1.7
2R R	30.0	20.7	20.7	30.0	11.4		21.3	13.5	3.2

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

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Lanes

Lane Performance
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 95% Back veh	Queue 95% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	476	575	0.828	33.6	1.28	8.5	213.6	2500.0
2 T	600	725	0.828	28.3	1.29	9.6	242.6	2500.0
3 R	194	1011	0.192	5.4	0.64	1.0	26.0	200.0T
East: Dunning Street WB								
1 LT	275	404	0.681	29.3	1.17	5.3	132.7	350.0
2 T	376	553	0.681	22.7	1.20	6.2	157.5	1600.0
3 R	210	687	0.305	9.0	0.87	2.1	51.4	200.0T
North: Route 9 SB								
1 LT	431	531	0.812	33.8	1.28	8.1	205.7	725.0
2 TR	468	576	0.812	31.8	1.28	8.5	215.5	725.0
West: Route 67 EB								
1 LT	590	660	0.894	38.7	1.40	12.0	300.6	1225.0
2 TR	604	675	0.894	38.1	1.41	12.1	308.5	1225.0

T Short lane due to specification of Turn Bay

Go to Table Links (Top)

Lane Flow and Capacity Information
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	356	120	0	476	150	575	0.828	100
2 T	0	600	0	600	150	725	0.828	100
3 R	0	0	194	194	150	1011	0.192	100
East: Dunning Street WB								
1 LT	162	113	0	275	150	404	0.681	100
2 T	0	376	0	376	150	553	0.681	100
3 R	0	0	210	210	150	687	0.305	100
North: Route 9 SB								
1 LT	162	269	0	431	150	531	0.812	100
2 TR	0	215	253	468	150	576	0.812	100
West: Route 67 EB								
1 LT	435	154	0	590	150	660	0.894	100
2 TR	0	335	269	604	150	675	0.894	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

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Lane, Approach and Intersection Performance
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (sec) 1st	2nd	Deg Sat x	Aver. Delay sec	Longest Queue ft	Shrt Lane ft
South: Route 9 NB												
1 LT	356	120		476	1				0.828	33.6	214	2500
2 T		600		600	2				0.828	28.3	243	2500
3 R			194	194	0				0.192	5.4	26	200
	356	720	194	1270	1				0.828	26.8	243	
East: Dunning Street WB												
1 LT	162	113		275	0				0.681	29.3	133	350
2 T		376		376	1				0.681	22.7	157	1600
3 R			210	210	0				0.305	9.0	51	200
	162	489	210	861	1				0.681	21.5	157	
North: Route 9 SB												
1 LT	162	269		431	1				0.812	33.8	206	725
2 TR		215	253	468	2				0.812	31.8	215	725
	162	484	253	899	2				0.812	32.7	215	
West: Route 67 EB												
1 LT	435	154		590	0				0.894	38.7	301	1225
2 TR		335	269	604	2				0.894	38.1	308	1225
	435	489	269	1194	1				0.894	38.4	308	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	4224	1	0.894	30.3	308

Peak flow period = 15 minutes.

Queue values in this table are 95% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

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Driver Characteristics
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec
South: Route 9 NB						
1 LT	18.5	1563	2.30	62.42	25.10	1.38
2 T	24.9	1837	1.96	71.50	25.40	1.26
3 R	NA - Short Lane					
East: Dunning Street WB						
1 LT	19.8	1638	2.20	63.93	25.08	1.34
2 T	24.9	2027	1.78	64.81	25.20	1.09
3 R	NA - Short Lane					

North: Route 9 SB						
1 LT	21.7	1410	2.55	81.10	25.25	1.76
2 TR	22.6	1490	2.42	80.22	25.40	1.65
West: Route 67 EB						
1 LT	18.6	1407	2.56	69.64	25.09	1.64
2 TR	23.0	1430	2.52	85.02	25.47	1.76

Saturation Flow and Saturation Headway are derived from follow-up headway.

Go to Table Links (Top)

Lane Delays
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
South: Route 9 NB										
1 LT	0.828	10.4	23.2	33.6	0.0	29.0	3.9	25.1	6.6	33.6
2 T	0.828	9.1	19.2	28.3	0.0	21.6	3.8	17.8	1.7	28.3
3 R	0.192	4.5	0.8	5.4	0.0	1.6	0.0	1.6	2.7	5.4
East: Dunning Street WB										
1 LT	0.681	12.3	17.0	29.3	0.0	24.7	2.7	22.0	5.6	29.3
2 T	0.681	9.9	12.8	22.7	0.0	16.0	2.8	13.2	1.7	22.7
3 R	0.305	6.8	2.3	9.0	0.0	3.7	0.0	3.7	2.7	9.0
North: Route 9 SB										
1 LT	0.812	10.8	23.0	33.8	0.0	28.7	4.1	24.6	4.2	33.8
2 TR	0.812	10.3	21.5	31.8	0.0	25.7	4.1	21.6	2.5	31.8
West: Route 67 EB										
1 LT	0.894	9.9	28.8	38.7	0.0	34.0	5.4	28.6	6.7	38.7
2 TR	0.894	9.8	28.3	38.1	0.0	31.7	5.4	26.3	2.4	38.1

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

Geometric delay is less than 2 seconds for some movements. The negotiation speed may be too high or the approach and exit speeds may be too low for given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds, negotiation radius or negotiation speed data in the Path Data dialog.

Go to Table Links (Top)

Lane Queues (Vehicles)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

	Deg.	Ovrfl.	Back of Queue (veh)			Queue	Prob.	P'ile	Cyc-Av. Queue

Lane No.	Satn x	Queue No	Nb1	Nb2	Nb	95%	Stor. Ratio	Block %	Block %	Nc	95%
South: Route 9 NB											
1 LT	0.828	1.1	2.3	1.2	3.4	8.5	0.09	0.0	100.0	4.4	8.1
2 T	0.828	1.1	2.5	1.3	3.8	9.6	0.10	0.0	100.0	4.7	8.6
3 R	0.192	0.0	0.4	0.0	0.4	1.0	0.13	0.0	100.0	0.3	0.5
East: Dunning Street WB											
1 LT	0.681	0.5	1.7	0.5	2.1	5.3	0.38	0.0	100.0	2.2	4.1
2 T	0.681	0.6	1.9	0.6	2.5	6.2	0.10	0.0	100.0	2.4	4.3
3 R	0.305	0.0	0.8	0.0	0.8	2.1	0.26	0.0	100.0	0.5	1.0
North: Route 9 SB											
1 LT	0.812	1.1	2.1	1.2	3.3	8.1	0.28	0.0	100.0	4.0	7.3
2 TR	0.812	1.1	2.2	1.2	3.4	8.5	0.30	0.0	100.0	4.1	7.5
West: Route 67 EB											
1 LT	0.894	1.8	2.6	2.2	4.8	12.0	0.25	0.0	100.0	6.3	11.5
2 TR	0.894	1.8	2.7	2.2	4.9	12.1	0.25	0.0	100.0	6.4	11.6

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queues (Distance)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	95%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	95%
South: Route 9 NB											
1 LT	0.828	26.8	56.5	29.4	85.9	213.6	0.09	0.0	100.0	111.6	202.4
2 T	0.828	29.2	63.5	34.1	97.6	242.6	0.10	0.0	100.0	119.8	217.3
3 R	0.192	0.0	10.4	0.0	10.4	26.0	0.13	0.0	100.0	7.2	13.1
East: Dunning Street WB											
1 LT	0.681	13.7	41.8	11.6	53.4	132.7	0.38	0.0	100.0	56.2	102.0
2 T	0.681	16.0	48.6	14.8	63.4	157.5	0.10	0.0	100.0	59.8	108.4
3 R	0.305	0.0	20.7	0.0	20.7	51.4	0.26	0.0	100.0	13.2	23.9
North: Route 9 SB											
1 LT	0.812	27.3	53.1	29.6	82.8	205.7	0.28	0.0	100.0	102.2	185.4
2 TR	0.812	28.2	55.4	31.3	86.7	215.5	0.30	0.0	100.0	104.8	190.2
West: Route 67 EB											
1 LT	0.894	44.0	66.2	54.7	120.9	300.6	0.25	0.0	100.0	159.1	288.6
2 TR	0.894	45.0	67.9	56.2	124.1	308.5	0.25	0.0	100.0	162.7	295.1

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1

Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (veh) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.828	3.4	4.4	6.2	7.2	8.5	9.4
2 T	0.828	3.8	5.0	7.0	8.1	9.6	10.6
3 R	0.192	0.4	0.5	0.8	0.9	1.0	1.2
East: Dunning Street WB							
1 LT	0.681	2.1	2.8	3.9	4.5	5.3	5.9
2 T	0.681	2.5	3.3	4.6	5.3	6.2	6.9
3 R	0.305	0.8	1.1	1.5	1.7	2.1	2.3
North: Route 9 SB							
1 LT	0.812	3.3	4.2	6.0	6.9	8.1	9.0
2 TR	0.812	3.4	4.4	6.2	7.2	8.5	9.4
West: Route 67 EB							
1 LT	0.894	4.8	6.2	8.8	10.2	12.0	13.3
2 TR	0.894	4.9	6.3	8.9	10.3	12.1	13.4

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Distance)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.828	85.9	111.3	156.9	181.6	213.6	237.1
2 T	0.828	97.6	126.4	178.2	206.3	242.6	269.3
3 R	0.192	10.4	13.5	19.1	22.1	26.0	28.8
East: Dunning Street WB							
1 LT	0.681	53.4	69.1	97.4	112.8	132.7	147.3
2 T	0.681	63.3	82.0	115.7	133.9	157.5	174.8
3 R	0.305	20.7	26.8	37.7	43.7	51.4	57.0
North: Route 9 SB							
1 LT	0.812	82.7	107.2	151.1	174.9	205.7	228.3
2 TR	0.812	86.7	112.3	158.3	183.2	215.5	239.2
West: Route 67 EB							
1 LT	0.894	120.9	156.6	220.7	255.6	300.6	333.6
2 TR	0.894	124.1	160.7	226.6	262.3	308.5	342.4

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Stops
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.828	0.98	0.29	0.01	1.28	608.5	0.67	319.1	0.98
2 T	0.828	1.00	0.29	0.00	1.29	773.6	0.64	382.3	1.00
3 R	0.192	0.52	0.00	0.12	0.64	123.1	0.00	0.0	0.62
East: Dunning Street WB									
1 LT	0.681	0.96	0.19	0.02	1.17	322.6	0.48	131.4	0.96
2 T	0.681	1.00	0.21	0.00	1.20	452.9	0.47	177.7	1.00
3 R	0.305	0.83	0.00	0.04	0.87	182.8	0.00	0.0	0.87
North: Route 9 SB									
1 LT	0.812	0.96	0.30	0.02	1.28	551.6	0.72	310.0	0.96
2 TR	0.812	0.97	0.30	0.01	1.28	599.2	0.71	332.0	0.97
West: Route 67 EB									
1 LT	0.894	1.00	0.40	0.00	1.40	828.4	0.91	537.4	1.00
2 TR	0.894	1.00	0.41	0.00	1.41	849.2	0.91	546.5	1.00

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	HV	Flow Scale Fixed	Var	Peak Flow Factor
South: Route 9 NB								
	South	3L	Left	1	0	1.00	1.00	0.93
	East	8R	Right	194	0	1.00	1.00	0.93
	North	8T	Thru	706	14	1.00	1.00	0.93
	West	3L	Left	355	0	1.00	1.00	0.93
East: Dunning Street WB								
	South	1L	Left	161	0	1.00	1.00	0.93
	East	1L	Left	1	0	1.00	1.00	0.93
	North	6R	Right	210	0	1.00	1.00	0.93
	West	6T	Thru	484	5	1.00	1.00	0.93
North: Route 9 SB								
	South	4T	Thru	474	10	1.00	1.00	0.93
	East	7L	Left	161	0	1.00	1.00	0.93
	North	7L	Left	1	0	1.00	1.00	0.93
	West	4R	Right	248	5	1.00	1.00	0.93
West: Route 67 EB								
	South	2R	Right	258	11	1.00	1.00	0.93
	East	2T	Thru	484	5	1.00	1.00	0.93
	North	5L	Left	387	0	1.00	1.00	0.93
	West	5L	Left	47	1	1.00	1.00	0.93

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

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Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	356	0	0	0	0	0
8T T	0	0	706	14	0	0
8R R	0	0	0	0	194	0
East: Dunning Street WB						
1L L	162	0	0	0	0	0
6T T	0	0	484	5	0	0
6R R	0	0	0	0	210	0
North: Route 9 SB						
7L L	162	0	0	0	0	0
4T T	0	0	474	10	0	0
4R R	0	0	0	0	248	5
West: Route 67 EB						
5L L	435	1	0	0	0	0
2T T	0	0	484	5	0	0
2R R	0	0	0	0	258	11

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

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Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

Intersection ID: 1
Roundabout

Mov ID	Left Total	Left %HV	Through Total	Through %HV	Right Total	Right %HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	356	0.0	0	0.0	0	0.0
8T T	0	0.0	720	2.0	0	0.0
8R R	0	0.0	0	0.0	194	0.0
East: Dunning Street WB						
1L L	162	0.0	0	0.0	0	0.0
6T T	0	0.0	489	1.0	0	0.0
6R R	0	0.0	0	0.0	210	0.0
North: Route 9 SB						
7L L	162	0.1	0	0.0	0	0.0
4T T	0	0.0	484	2.0	0	0.0
4R R	0	0.0	0	0.0	253	2.0
West: Route 67 EB						
5L L	435	0.2	0	0.0	0	0.0
2T T	0	0.0	489	1.0	0	0.0
2R R	0	0.0	0	0.0	269	4.0

```
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

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Other

Model Settings
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: US HCM (Customary)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  HCM Delay Model option used
  HCM Queue Model option used
  Level of Service based on: Delay (HCM 2000)
  Queue percentile: 95%
```

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Parameters Used in Cost Calculations
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

```
Intersection ID: 1
Roundabout


   Pump price of fuel ($/US gal)              =     2.400
   Fuel resource cost factor                  =      0.70
   Ratio of running cost to fuel cost         =       3.0
   Average income ($/h)                       =     19.00
   Time value factor                          =      0.40
   Light vehicle mass (1000 lb)               =       3.1
   Heavy vehicle mass (1000 lb)               =      24.0
   Light vehicle idle fuel rate (US gal/h)    =     0.360
   Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

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Diagnostics
Site:Route 9/Route 67/Dunning Street - PM Peak - Build 2022 w/Imp

```
Geometric delay is less than 2 seconds for some movements.  The negotiation
speed may be too high or the approach and exit speeds may be too low for
given geometric design (e.g. for a large roundabout).
Check Detailed Output for geometric delay data including negotiation speeds.
If necessary, specify appropriate values of approach and exit speeds,
negotiation radius or negotiation speed data in the Path Data dialog.
```

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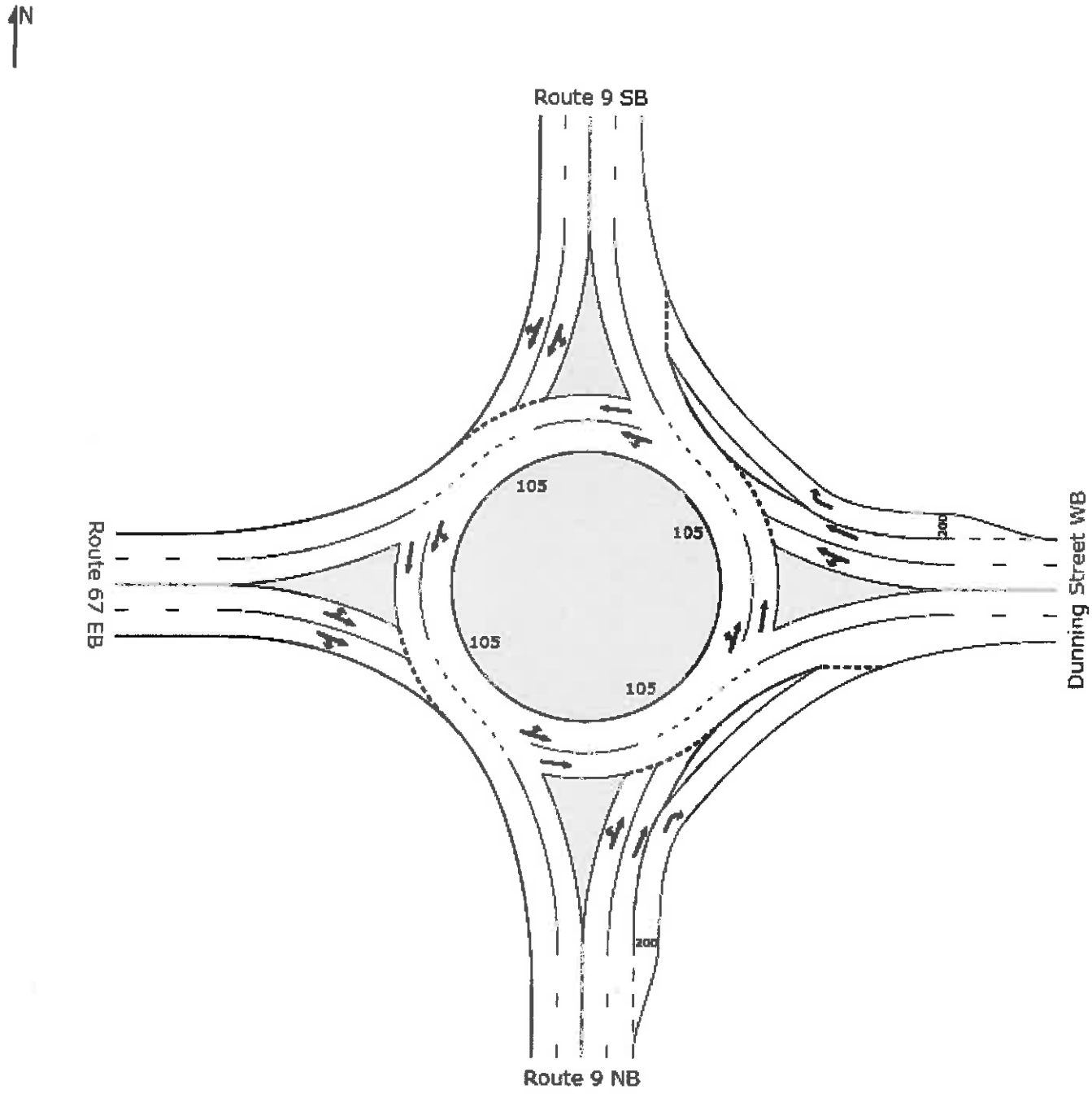
N
Route 9 SB
Route 67 EB
Dunning Street WB
Route 9 NB
105
105
105
105
200
200

DETAILED OUTPUT

Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Route 9/Route 67/Round Lake Bypass
No-Build 2022
AM Peak Hour
Roundabout

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Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Cent Island Diam ft	Circ Width ft	Insc Diam. ft	Ent Rad ft	Ent Ang deg	Cir Lan	Ent Lan	Av.Ent Lane Width ft	Circulating/Exiting Stream Flow veh/h	%HV	Adjust. Flow pcu/h	%Exit Incl.	Cap. Constr. Effect	O-D Factor
South: Route 9 NB													
Environment Factor: 1.20							Entry/Circulating Flow Adjustment: Medium						
120	16	152	100	30	1	2	13.00	463	16.7	541	0	N	0.922

```
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  353  7.9   380     0     N     0.964
-------------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00   63 15.7    73     0     N     0.988
-------------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   1  13.00  558  6.5   594     0     N     0.966
-------------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

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Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

```
Intersection ID: 1
Roundabout

-------------------------------------------------------------------------------
Turn Lane    Lane    ---- Circulating/Exiting Stream ---   Critical Gap
     No.     Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                      Rate  Speed   Dist Headway Bunched   Hdwy    Dist  Headway
                     pcu/h   mph     ft    sec              sec     ft     sec
-------------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  541   19.7   192.8  2.00   0.486    6.68   193.6    3.72
Thru  1 Subdominant  541   19.7   192.8  2.00   0.486    4.72   136.8    2.63
      2 Dominant     541   19.7   192.8  2.00   0.486    4.25   123.1    2.37
Right 2 Dominant     541   19.7   192.8  2.00   0.486    4.01   116.1    2.23
-------------------------------------------------------------------------------
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  380   21.6   299.3  1.44   0.283    7.81   247.1    5.00
Thru  2 Dominant     380   21.6   299.3  1.44   0.283    4.48   141.6    2.87
Right 2 Dominant     380   21.6   299.3  1.44   0.283    4.35   137.7    2.79
-------------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant   73   22.3  1614.8  1.47   0.063    4.71   154.4    2.83
Thru  1 Subdominant   73   22.3  1614.8  1.47   0.063    4.53   148.4    2.72
      2 Dominant      73   22.3  1614.8  1.47   0.063    4.41   144.7    2.65
Right 2 Dominant      73   22.3  1614.8  1.47   0.063    4.47   146.5    2.68
-------------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Dominant     594   22.2   196.9  1.26   0.365    4.93   160.2    3.28
Thru  1 Dominant     594   22.2   196.9  1.26   0.365    5.83   189.6    3.88
Right 1 Dominant     594   22.2   196.9  1.26   0.365    4.52   147.0    3.01
-------------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

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Movements

Movement Capacity Parameters
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Movement Flow veh/h	HV %	Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	5	50.0	463	16.7	541	34	0.85	453	100	0.154
8T T	205	6.0	463	16.7	541	1335	0.85	453	100	0.154
8R R	37	0.0	463	16.7	541	240	0.85	453	100	0.154
East: Route 67 WB										
1L L	11	33.0	353	7.9	380	407	0.85	3189	100	0.026
6T T	47	8.0	353	7.9	380	160	0.85	188	100	0.295
6R R	221	5.0	353	7.9	380	749	0.85	188	100	0.295
North: Route 9 SB										
7L L	142	9.0	63	15.7	73	474	0.85	184	100	0.300
4T T	405	5.0	63	15.7	73	1352	0.85	184	100	0.300
4R R	189	6.0	63	15.7	73	632	0.85	184	100	0.300
West: Round Lake Bypass EB										
5L L	142	9.0	558	6.5	594	237	0.85	42	100	0.601*
2T T	179	29.0	558	6.5	594	298	0.85	42	100	0.601*
2R R	5	0.0	558	6.5	594	9	0.85	42	100	0.601*

* Maximum degree of saturation

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Movement Performance
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB									
3L L	0.01	0.01	6.6	0.94	5.0	0.10	2.5	0.1	32.1
8T T	0.35	0.42	6.1	0.73	149.0	3.43	90.5	2.5	35.9
8R R	0.06	0.07	5.6	0.73	26.9	0.57	14.6	0.4	34.7
East: Route 67 WB									
1L L	0.03	0.03	9.2	0.77	8.1	0.22	4.9	0.2	28.1
6T T	0.09	0.11	7.1	0.68	32.2	0.84	20.9	0.6	32.4
6R R	0.43	0.52	7.1	0.72	160.1	3.94	96.3	3.0	31.9
North: Route 9 SB									
7L L	0.23	0.27	5.8	0.78	111.5	2.22	60.9	2.0	30.8
4T T	0.64	0.77	5.7	0.54	218.8	5.86	178.7	5.0	35.9
4R R	0.29	0.35	5.6	0.61	116.2	2.79	82.5	2.3	35.3
West: Round Lake Bypass EB									
5L L	0.75	0.90	19.1	1.04	148.3	3.46	66.6	2.6	25.8
2T T	0.95	1.14	19.1	0.94	167.5	4.02	71.5	2.7	26.1
2R R	0.03	0.03	19.1	0.98	5.2	0.12	2.3	0.1	27.2

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Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1

Roundabout

Mov ID	Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB						
3L L	3.01	0.4	4.2	0.42	0.005	0.013
8T T	58.44	6.9	65.8	6.55	0.110	0.199
8R R	7.85	0.8	7.4	0.64	0.013	0.021
	69.30	8.2	77.4	7.60	0.128	0.233
East: Route 67 WB						
1L L	5.19	0.7	6.6	0.67	0.009	0.020
6T T	14.54	1.7	16.1	1.62	0.026	0.047
6R R	65.52	7.4	70.5	7.23	0.120	0.206
	85.25	9.8	93.2	9.51	0.156	0.274
North: Route 9 SB						
7L L	39.43	4.1	39.4	3.45	0.063	0.110
4T T	110.64	12.8	121.7	11.75	0.204	0.361
4R R	54.06	6.4	60.6	6.08	0.103	0.182
	204.14	23.4	221.7	21.28	0.370	0.653
West: Round Lake Bypass EB						
5L L	54.28	5.9	56.0	5.52	0.094	0.164
2T T	65.09	7.7	73.3	6.58	0.103	0.211
2R R	1.57	0.2	1.5	0.15	0.003	0.004
	120.95	13.7	130.7	12.25	0.199	0.379
INTERSECTION:	479.63	55.1	523.1	50.63	0.853	1.539

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Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.76	5.7	1050.6	105.15	1.365	3.290
8T T	0.40	13.0	452.1	44.94	0.753	1.367
8R R	0.33	18.6	316.2	27.18	0.556	0.888
	0.40	13.2	447.4	43.91	0.740	1.346
East: Route 67 WB						
1L L	0.65	7.2	831.0	83.88	1.160	2.520
6T T	0.43	12.3	479.8	48.09	0.778	1.410
6R R	0.42	12.9	455.0	46.62	0.776	1.332
	0.43	12.4	474.4	48.37	0.791	1.394
North: Route 9 SB						
7L L	0.40	14.7	402.0	35.21	0.648	1.118
4T T	0.38	13.9	423.0	40.85	0.709	1.256
4R R	0.41	12.9	456.4	45.73	0.772	1.372
	0.39	13.8	427.6	41.04	0.714	1.259
West: Round Lake Bypass EB						
5L L	0.51	11.3	522.1	51.46	0.875	1.527

2T T	0.57	9.3	636.5	57.18	0.891	1.835
2R R	0.43	14.5	406.6	40.27	0.761	1.168
	0.54	10.2	578.5	54.19	0.882	1.678
INTERSECTION:	0.43	12.6	469.5	45.44	0.765	1.381

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Intersection Negotiation Data
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?
South: Route 9 NB								
	East	Right	129.8	21.1	58.7	1600	471	No
	North	Thru	212.4	25.4	151.3	1600	778	No
	West	Left	64.0	16.2	251.3	1600	1114	No
East: Route 67 WB								
	South	Left	62.8	16.0	246.6	1600	1094	No
	North	Right	116.6	20.3	63.5	1600	731	No
	West	Thru	190.7	24.4	154.9	1600	807	No
North: Route 9 SB								
	South	Thru	190.7	24.4	154.9	1600	777	No
	East	Left	64.0	16.2	251.3	1600	666	No
	West	Right	116.6	20.3	63.5	1600	730	No
West: Round Lake Bypass EB								
	South	Right	129.6	21.1	63.4	1600	703	No
	East	Thru	212.4	25.4	151.3	1600	679	No
	North	Left	64.0	16.2	251.3	1600	900	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

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Movement Speeds and Geometric Delay
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	55.0	16.2	16.2	55.0			35.6	32.1	19.4
8T T	55.0	25.4	25.4	55.0			37.3	35.9	9.5
8R R	55.0	21.1	21.1	45.0			36.2	34.7	9.2
East: Route 67 WB									
1L L	45.0	16.0	16.0	55.0			31.7	28.1	16.8
6T T	45.0	24.4	24.4	55.0			35.0	32.4	8.3
6R R	45.0	20.3	20.3	55.0			34.8	31.9	9.1

North: Route 9 SB									
7L	L	55.0	16.2	16.2	45.0		34.2	30.8	15.6
4T	T	55.0	24.4	24.4	55.0		39.5	35.9	9.8
4R	R	55.0	20.3	20.3	55.0		39.0	35.3	10.8
West: Round Lake Bypass EB									
5L	L	55.0	16.2	16.2	55.0	12.0	33.5	25.8	17.1
2T	T	55.0	25.4	25.4	45.0	11.2	33.7	26.1	9.1
2R	R	55.0	21.1	21.1	55.0	12.4	34.9	27.2	10.2

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

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Lanes

Lane Performance
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 50% Back veh	Queue 50% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	112	725	0.154	6.6	0.75	0.4	9.4	1600.0
2 TR	136	883	0.154	5.6	0.72	0.4	9.7	1600.0
East: Route 67 WB								
1 L	11	407	0.026	9.2	0.77	0.0	1.2	225.0T
2 TR	268	909	0.295	7.1	0.72	0.6	15.0	1600.0
North: Route 9 SB								
1 LT	362	1206	0.300	5.8	0.63	0.7	17.9	1600.0
2 TR	375	1252	0.300	5.6	0.58	0.7	17.8	1600.0
West: Round Lake Bypass EB								
1 LTR	326	543	0.601	19.1	0.98	1.5	44.4	1600.0

T Short lane due to specification of Turn Bay

Go to Table Links (Top)

Lane Flow and Capacity Information
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	5	106	0	112	112	725	0.154	100
2 TR	0	99	37	136	136	883	0.154	100
East: Route 67 WB								
1 L	11	0	0	11	11	407	0.026	100
2 TR	0	47	221	268	150	909	0.295	100
North: Route 9 SB								
1 LT	142	220	0	362	150	1206	0.300	100

2 TR	0	186	189	375	150	1252	0.300	100

West: Round Lake Bypass EB

1 LTR	142	179	5	326	150	543	0.601	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

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Lane, Approach and Intersection Performance
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (sec) 1st	2nd	Deg Sat x	Aver. Delay sec	Longest Queue ft	Shrt Lane ft
South: Route 9 NB												
1 LT	5	106		112	8				0.154	6.6	9	1600
2 TR		99	37	136	4				0.154	5.6	10	1600
	5	205	37	247	6				0.154	6.1	10	
East: Route 67 WB												
1 L	11			11	33				0.026	9.2	1	225
2 TR		47	221	268	6				0.295	7.1	15	1600
	11	47	221	279	7				0.295	7.2	15	
North: Route 9 SB												
1 LT	142	220		362	7				0.300	5.8	18	1600
2 TR		186	189	375	6				0.300	5.6	18	1600
	142	405	189	737	6				0.300	5.7	18	
West: Round Lake Bypass EB												
1 LTR	142	179	5	326	20				0.601	19.1	44	1600
	142	179	5	326	20				0.601	19.1	44	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	1589	9	0.601	8.8	44

Peak flow period = 15 minutes.

Queue values in this table are 50% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

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Driver Characteristics
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec
South: Route 9 NB						
1 LT	25.0	1343	2.68	98.33	26.62	1.96

2 TR	24.3	1546	2.33	82.93	25.87	1.60
East: Route 67 WB						
1 L	NA - Short Lane					
2 TR	21.0	1286	2.80	86.28	26.11	1.95
North: Route 9 SB						
1 LT	21.2	1303	2.76	85.79	26.31	1.91
2 TR	22.3	1349	2.67	87.39	26.10	1.87
West: Round Lake Bypass EB						
1 LTR	21.3	998	3.61	112.81	28.96	2.68

Saturation Flow and Saturation Headway are derived from follow-up headway.

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Lane Delays
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
		Delay (seconds/veh)								
South: Route 9 NB										
1 LT	0.154	5.7	0.9	6.6	0.0	2.3	0.0	2.3	9.9	6.6
2 TR	0.154	4.8	0.7	5.6	0.0	1.3	0.0	1.3	9.4	5.6
East: Route 67 WB										
1 L	0.026	9.0	0.2	9.2	0.0	6.7	0.0	6.7	16.8	9.2
2 TR	0.295	5.4	1.6	7.1	0.0	4.0	0.0	4.0	9.0	7.1
North: Route 9 SB										
1 LT	0.300	4.5	1.3	5.8	0.0	4.4	0.0	4.4	12.1	5.8
2 TR	0.300	4.4	1.2	5.6	0.0	4.1	0.0	4.1	10.3	5.6
West: Round Lake Bypass EB										
1 LTR	0.601	9.6	9.5	19.1	0.0	15.3	1.7	13.6	12.6	19.1

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

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Lane Queues (Vehicles)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (veh) Nb1	Nb2	Nb	50%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	50%
South: Route 9 NB											
1 LT	0.154	0.0	0.4	0.0	0.4	0.4	0.01	0.0	100.0	0.2	0.2

2 TR	0.154	0.0	0.4	0.0	0.4	0.4	0.01	0.0	100.0	0.2	0.2
East: Route 67 WB											
1 L	0.026	0.0	0.0	0.0	0.0	0.0	0.01	0.0	100.0	0.0	0.0
2 TR	0.295	0.0	0.6	0.0	0.6	0.6	0.01	0.0	100.0	0.5	0.5
North: Route 9 SB											
1 LT	0.300	0.0	0.7	0.0	0.7	0.7	0.01	0.0	100.0	0.6	0.6
2 TR	0.300	0.0	0.7	0.0	0.7	0.7	0.01	0.0	100.0	0.6	0.6
West: Round Lake Bypass EB											
1 LTR	0.601	0.3	1.2	0.3	1.5	1.5	0.03	0.0	100.0	1.7	1.7

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queues (Distance)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	50%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	50%
South: Route 9 NB											
1 LT	0.154	0.0	9.4	0.0	9.4	9.4	0.01	0.0	100.0	5.5	5.5
2 TR	0.154	0.0	9.7	0.0	9.7	9.7	0.01	0.0	100.0	5.5	5.5
East: Route 67 WB											
1 L	0.026	0.0	1.2	0.0	1.2	1.2	0.01	0.0	100.0	0.9	0.9
2 TR	0.295	0.0	15.0	0.0	15.0	15.0	0.01	0.0	100.0	13.8	13.8
North: Route 9 SB											
1 LT	0.300	0.0	17.9	0.0	17.9	17.9	0.01	0.0	100.0	15.2	15.2
2 TR	0.300	0.0	17.8	0.0	17.8	17.8	0.01	0.0	100.0	15.2	15.2
West: Round Lake Bypass EB											
1 LTR	0.601	7.9	35.4	9.0	44.4	44.4	0.03	0.0	100.0	50.1	50.2

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (veh) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.154	0.4	0.5	0.6	0.7	0.9	1.0
2 TR	0.154	0.4	0.5	0.7	0.8	0.9	1.0

East: Route 67 WB							
1 L	0.026	0.0	0.0	0.1	0.1	0.1	0.1
2 TR	0.295	0.6	0.7	1.0	1.2	1.4	1.6
North: Route 9 SB							
1 LT	0.300	0.7	0.9	1.2	1.4	1.7	1.9
2 TR	0.300	0.7	0.9	1.2	1.4	1.7	1.9
West: Round Lake Bypass EB							
1 LTR	0.601	1.5	2.0	2.8	3.2	3.8	4.2

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queue Percentiles (Distance)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.154	9.4	12.2	17.2	19.9	23.4	25.9
2 TR	0.154	9.7	12.6	17.7	20.6	24.2	26.8
East: Route 67 WB							
1 L	0.026	1.2	1.5	2.2	2.5	2.9	3.3
2 TR	0.295	15.0	19.4	27.4	31.7	37.3	41.4
North: Route 9 SB							
1 LT	0.300	17.9	23.1	32.6	37.8	44.4	49.3
2 TR	0.300	17.8	23.1	32.5	37.7	44.3	49.2
West: Round Lake Bypass EB							
1 LTR	0.601	44.4	57.5	81.0	93.8	110.3	122.4

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Stops
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.154	0.55	0.00	0.20	0.75	83.4	0.00	0.0	0.66
2 TR	0.154	0.51	0.00	0.20	0.72	97.5	0.00	0.0	0.65
East: Route 67 WB									
1 L	0.026	0.41	0.00	0.36	0.77	8.1	0.00	0.0	0.51
2 TR	0.295	0.43	0.00	0.29	0.72	192.4	0.00	0.0	0.51
North: Route 9 SB									
1 LT	0.300	0.12	0.00	0.52	0.63	229.4	0.00	0.0	0.25
2 TR	0.300	0.11	0.00	0.46	0.58	217.2	0.00	0.0	0.25

West: Round Lake Bypass EB								
1 LTR	0.601	0.74	0.07	0.17	0.98	320.9	0.25	80.0	0.74

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale Fixed	Flow Scale Var	Peak Flow Factor
South: Route 9 NB								
	East	8R	Right	37	0	1.00	1.00	0.95
	North	8T	Thru	193	12	1.00	1.00	0.95
	West	3L	Left	3	3	1.00	1.00	0.95
East: Route 67 WB								
	South	1L	Left	7	3	1.00	1.00	0.95
	North	6R	Right	210	11	1.00	1.00	0.95
	West	6T	Thru	44	4	1.00	1.00	0.95
North: Route 9 SB								
	South	4T	Thru	385	20	1.00	1.00	0.95
	East	7L	Left	129	13	1.00	1.00	0.95
	West	4R	Right	178	11	1.00	1.00	0.95
West: Round Lake Bypass EB								
	South	2R	Right	5	0	1.00	1.00	0.95
	East	2T	Thru	127	52	1.00	1.00	0.95
	North	5L	Left	129	13	1.00	1.00	0.95

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

Go to Table Links (Top)

Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	3	3	0	0	0	0
8T T	0	0	193	12	0	0
8R R	0	0	0	0	37	0
East: Route 67 WB						
1L L	7	3	0	0	0	0
6T T	0	0	44	4	0	0
6R R	0	0	0	0	210	11

```
North: Route 9 SB
   7L L     129    13      0     0      0     0
   4T T       0     0    385    20      0     0
   4R R       0     0      0     0    178    11
-----------------------------------------------
West: Round Lake Bypass EB
   5L L     129    13      0     0      0     0
   2T T       0     0    127    52      0     0
   2R R       0     0      0     0      5     0
-----------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

```
Intersection ID: 1
Roundabout

---------------------------------------------------
  Mov          Left         Through        Right
  ID         ----------    ----------    ----------
             Total  %HV    Total  %HV    Total  %HV
---------------------------------------------------
Demand flows in veh/h as used by the program
South: Route 9 NB
   3L L        5  50.0       0   0.0       0   0.0
   8T T        0   0.0     205   6.0       0   0.0
   8R R        0   0.0       0   0.0      37   0.0
---------------------------------------------------
East: Route 67 WB
   1L L       11  33.0       0   0.0       0   0.0
   6T T        0   0.0      47   8.0       0   0.0
   6R R        0   0.0       0   0.0     221   5.0
---------------------------------------------------
North: Route 9 SB
   7L L      142   9.0       0   0.0       0   0.0
   4T T        0   0.0     405   5.0       0   0.0
   4R R        0   0.0       0   0.0     189   6.0
---------------------------------------------------
West: Round Lake Bypass EB
   5L L      142   9.0       0   0.0       0   0.0
   2T T        0   0.0     179  29.0       0   0.0
   2R R        0   0.0       0   0.0       5   0.0
---------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: Copy of US HCM (US)
  Peak Flow Period (for performance): 15 minutes
```

```
Unit time (for volumes): 60 minutes.
HCM Delay Model option used
HCM Queue Model option used
Level of Service based on: Delay (HCM 2000)
Queue percentile: 50%
```

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Parameters Used in Cost Calculations
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

```
Intersection ID: 1
Roundabout


   Pump price of fuel ($/US gal)              =     2.400
   Fuel resource cost factor                  =      0.70
   Ratio of running cost to fuel cost         =       3.0
   Average income ($/h)                       =     19.00
   Time value factor                          =      0.40
   Light vehicle mass (1000 lb)               =       3.1
   Heavy vehicle mass (1000 lb)               =      24.0
   Light vehicle idle fuel rate (US gal/h)    =     0.360
   Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

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Diagnostics
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - No-Build 2022 - RC

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DETAILED OUTPUT

Route 9/Route 67/Round Lake Bypass
- AM Peak - Build 2022 - RC

Route 9/Route 67/Round Lake Bypass
Build 2022
AM Peak Hour
Roundabout

OUTPUT TABLE LINKS

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Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Cent Island Diam ft	Circ Width ft	Insc Diam. ft	Ent Rad ft	Ent Ang deg	Cir Lan	Ent Lan	Av.Ent Lane Width ft	Circulating/Exiting Stream Flow veh/h	%HV	Adjust. Flow pcu/h	%Exit Incl.	Cap. Constr. Effect	O-D Factor
South: Route 9 NB													
Environment Factor: 1.20 Entry/Circulating Flow Adjustment: Medium													
120	16	152	100	30	1	2	13.00	667	18.9	793	0	Y	0.781

```
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  432  7.9   466     0     Y     0.945
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  116 14.5   133     0     N     0.976
-----------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   1  13.00  574  7.0   614     0     N     0.950
-----------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

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Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
Turn Lane    Lane    ---- Circulating/Exiting Stream ---   Critical Gap
     No.     Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                      Rate  Speed   Dist Headway Bunched    Hdwy    Dist  Headway
                     pcu/h   mph     ft    sec              sec     ft     sec
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  793   20.8   138.2  2.00   0.634    6.35   193.4    3.66
Thru  1 Subdominant  793   20.8   138.2  2.00   0.634    4.49   136.7    2.59
      2 Dominant     793   20.8   138.2  2.00   0.634    3.93   119.6    2.27
Right 2 Dominant     793   20.8   138.2  2.00   0.634    3.71   112.8    2.14
-----------------------------------------------------------------------------
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  466   21.1   239.8  1.59   0.364    7.69   238.4    5.00
Thru  2 Dominant     466   21.1   239.8  1.59   0.364    4.35   135.0    2.83
Right 2 Dominant     466   21.1   239.8  1.59   0.364    4.23   131.2    2.75
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  133   22.5   897.5  1.43   0.109    4.70   155.3    2.86
Thru  1 Subdominant  133   22.5   897.5  1.43   0.109    4.52   149.3    2.75
      2 Dominant     133   22.5   897.5  1.43   0.109    4.48   148.1    2.73
Right 2 Dominant     133   22.5   897.5  1.43   0.109    4.54   149.9    2.76
-----------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Dominant     614   22.1   189.8  1.30   0.385    4.87   157.6    3.25
Thru  1 Dominant     614   22.1   189.8  1.30   0.385    5.69   184.4    3.80
Right 1 Dominant     614   22.1   189.8  1.30   0.385    4.47   144.6    2.98
-----------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

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Movements

Movement Capacity Parameters
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID		Demand Flow veh/h	HV %	Opposing Movement Flow veh/h	HV %	Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB											
3L	L	5	50.0	667	18.9	793	16	0.85	162	100	0.325
8T	T	232	6.0	667	18.9	793	713	0.85	162	100	0.325
8R	R	132	0.0	667	18.9	793	405	0.85	162	100	0.325
East: Route 67 WB											
1L	L	21	33.0	432	7.9	466	362	0.85	1360	100	0.058
6T	T	89	8.0	432	7.9	466	243	0.85	131	100	0.368
6R	R	221	5.0	432	7.9	466	600	0.85	131	100	0.368
North: Route 9 SB											
7L	L	142	9.0	116	14.5	133	424	0.85	154	100	0.335
4T	T	411	5.0	116	14.5	133	1225	0.85	154	100	0.335
4R	R	205	6.0	116	14.5	133	613	0.85	154	100	0.335
West: Round Lake Bypass EB											
5L	L	295	9.0	574	7.0	614	195	0.85	-44	100	1.514*
2T	T	500	29.0	574	7.0	614	330	0.85	-44	100	1.514*
2R	R	5	0.0	574	7.0	614	3	0.85	-44	100	1.514*

* Maximum degree of saturation

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Movement Performance
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID		Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB										
3L	L	0.02	0.02	12.4	1.00	5.2	0.12	2.5	0.1	29.2
8T	T	0.75	0.89	11.6	0.91	210.3	4.98	102.1	3.2	31.9
8R	R	0.36	0.43	9.9	0.88	115.3	2.57	52.2	1.7	31.3
East: Route 67 WB										
1L	L	0.06	0.08	10.9	0.84	17.7	0.47	9.9	0.4	27.4
6T	T	0.21	0.26	8.6	0.75	66.9	1.69	39.5	1.3	31.4
6R	R	0.53	0.63	8.6	0.78	173.0	4.19	96.3	3.1	31.0
North: Route 9 SB										
7L	L	0.26	0.31	6.5	0.79	111.8	2.28	60.9	2.0	30.4
4T	T	0.74	0.88	6.5	0.57	235.5	6.18	181.1	5.1	35.2
4R	R	0.37	0.44	6.4	0.64	130.5	3.14	89.4	2.6	34.7
West: Round Lake Bypass EB										
5L	L	21.42	25.70	261.6	3.63	1069.0	44.47	138.2	25.2	5.5
2T	T	36.33	43.60	261.6	3.49	1744.3	74.43	199.8	41.3	4.8
2R	R	0.38	0.46	261.6	3.71	19.5	0.79	2.3	0.4	5.2

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Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1

Roundabout

Mov ID	Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB						
3L L	3.13	0.4	4.2	0.42	0.006	0.013
8T T	70.84	8.2	77.4	7.77	0.131	0.233
8R R	30.09	2.9	27.7	2.41	0.049	0.077
	104.06	11.5	109.4	10.61	0.186	0.324
East: Route 67 WB						
1L L	10.51	1.4	13.3	1.34	0.019	0.040
6T T	28.03	3.3	30.9	3.11	0.050	0.091
6R R	66.75	7.5	71.2	7.29	0.122	0.208
	105.28	12.1	115.4	11.73	0.190	0.339
North: Route 9 SB						
7L L	39.88	4.2	39.7	3.48	0.064	0.111
4T T	113.85	13.2	125.0	12.20	0.211	0.372
4R R	59.34	7.0	66.3	6.67	0.112	0.200
	213.06	24.4	231.1	22.34	0.387	0.682
West: Round Lake Bypass EB						
5L L	348.32	21.9	207.6	16.88	0.399	0.464
2T T	608.50	41.8	399.8	32.03	0.682	0.946
2R R	5.67	0.3	3.0	0.23	0.006	0.006
	962.49	63.9	610.4	49.14	1.087	1.416
INTERSECTION:	1384.89	112.0	1066.2	93.82	1.851	2.762

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.79	5.6	1069.0	106.44	1.393	3.338
8T T	0.43	12.5	471.3	47.29	0.797	1.421
8R R	0.36	17.8	330.0	28.71	0.589	0.921
	0.41	13.6	433.6	42.04	0.737	1.284
East: Route 67 WB						
1L L	0.66	7.1	835.4	84.26	1.169	2.531
6T T	0.44	12.1	486.3	48.94	0.792	1.431
6R R	0.43	12.8	459.5	47.03	0.784	1.344
	0.45	12.0	492.2	50.07	0.812	1.448
North: Route 9 SB						
7L L	0.41	14.6	405.1	35.51	0.653	1.128
4T T	0.39	13.7	429.1	41.86	0.723	1.277
4R R	0.41	12.8	460.9	46.32	0.781	1.387
	0.40	13.6	433.3	41.90	0.726	1.279
West: Round Lake Bypass EB						
5L L	1.57	6.3	933.5	75.92	1.794	2.088

2T T	1.89	4.8	1243.3	99.58	2.120	2.942
2R R	1.53	7.3	804.4	62.65	1.707	1.607
	1.76	5.3	1114.6	89.73	1.985	2.586
INTERSECTION:	0.88	8.7	680.2	59.85	1.180	1.762

Go to Table Links (Top)

Intersection Negotiation Data
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?
South: Route 9 NB								
	East	Right	129.8	21.1	58.7	1600	483	No
	North	Thru	212.4	25.4	151.3	1600	789	No
	West	Left	64.0	16.2	251.3	1600	1112	No
East: Route 67 WB								
	South	Left	62.8	16.0	246.6	1600	1094	No
	North	Right	116.6	20.3	63.5	1600	729	No
	West	Thru	190.7	24.4	154.9	1600	804	No
North: Route 9 SB								
	South	Thru	190.7	24.4	154.9	1600	778	No
	East	Left	64.0	16.2	251.3	1600	666	No
	West	Right	116.6	20.3	63.5	1600	731	No
West: Round Lake Bypass EB								
	South	Right	129.6	21.1	63.4	1600	700	No
	East	Thru	212.4	25.4	151.3	1600	672	No
	North	Left	64.0	16.2	251.3	1600	896	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

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Movement Speeds and Geometric Delay
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	55.0	16.2	16.2	55.0			35.6	29.2	19.4
8T T	55.0	25.4	25.4	55.0			35.9	31.9	9.5
8R R	55.0	21.1	21.1	45.0			34.8	31.3	9.2
East: Route 67 WB									
1L L	45.0	16.0	16.0	55.0			31.5	27.4	16.8
6T T	45.0	24.4	24.4	55.0			34.6	31.4	8.3
6R R	45.0	20.3	20.3	55.0			34.5	31.0	9.1

North: Route 9 SB									
7L	L	55.0	16.2	16.2	45.0		34.0	30.4	15.6
4T	T	55.0	24.4	24.4	55.0		38.8	35.2	9.8
4R	R	55.0	20.3	20.3	55.0		38.4	34.7	10.8
West: Round Lake Bypass EB									
5L	L	55.0	16.2	16.2	55.0	12.0	15.1	5.5	17.1
2T	T	55.0	25.4	25.4	45.0	11.3	13.9	4.8	9.1
2R	R	55.0	21.1	21.1	55.0	12.4	14.4	5.2	10.2

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

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Lanes

Lane Performance
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 50% Back veh	Queue 50% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	160	491	0.325	12.4	0.92	0.9	23.2	1600.0
2 TR	209	643	0.325	9.9	0.88	1.0	25.0	1600.0
East: Route 67 WB								
1 L	21	362	0.058	10.9	0.84	0.1	2.7	225.0T
2 TR	311	844	0.368	8.6	0.77	0.8	20.5	1600.0
North: Route 9 SB								
1 LT	375	1121	0.335	6.5	0.65	0.8	20.5	1600.0
2 TR	382	1142	0.335	6.4	0.61	0.8	20.4	1600.0
West: Round Lake Bypass EB								
1 LTR	800	528	1.514	261.6	3.54	39.6	1160.2	1600.0

T Short lane due to specification of Turn Bay

Go to Table Links (Top)

Lane Flow and Capacity Information
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	5	154	0	160	150	491	0.325	100
2 TR	0	77	132	209	150	643	0.325	100
East: Route 67 WB								
1 L	21	0	0	21	21	362	0.058	100
2 TR	0	89	221	311	150	844	0.368	100
North: Route 9 SB								
1 LT	142	233	0	375	150	1121	0.335	100

2 TR	0	177	205	382	150	1142	0.335	100
West: Round Lake Bypass EB								
1 LTR	295	500	5	800	150	528	1.514	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

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Lane, Approach and Intersection Performance
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (sec) 1st	2nd	Deg Sat x	Aver. Delay sec	Longest Queue ft	Shrt Lane ft
South: Route 9 NB												
1 LT	5	154		160	7				0.325	12.4	23	1600
2 TR		77	132	209	2				0.325	9.9	25	1600
	5	232	132	368	4				0.325	11.0	25	
East: Route 67 WB												
1 L	21			21	33				0.058	10.9	3	225
2 TR		89	221	311	6				0.368	8.6	21	1600
	21	89	221	332	8				0.368	8.7	21	
North: Route 9 SB												
1 LT	142	233		375	7				0.335	6.5	20	1600
2 TR		177	205	382	6				0.335	6.4	20	1600
	142	411	205	758	6				0.335	6.5	20	
West: Round Lake Bypass EB												
1 LTR	295	500	5	800	21				1.514	261.6	1160	1600
	295	500	5	800	21				1.514	261.6	1160	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	2258	11	1.514	97.9	1160

Peak flow period = 15 minutes.

Queue values in this table are 50% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Go to Table Links (Top)

Driver Characteristics
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec
South: Route 9 NB						
1 LT	25.1	1372	2.62	96.77	26.49	1.91

2 TR	22.7	1648	2.18	72.81	25.44	1.42
East: Route 67 WB						
1 L	NA - Short Lane					
2 TR	21.5	1297	2.77	87.40	26.17	1.94
North: Route 9 SB						
1 LT	21.3	1290	2.79	87.16	26.30	1.95
2 TR	22.2	1312	2.74	89.36	26.11	1.94
West: Round Lake Bypass EB						
1 LTR	22.0	1001	3.60	115.98	29.29	2.69

Saturation Flow and Saturation Headway are derived from follow-up headway.

Go to Table Links (Top)

Lane Delays
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
		Delay (seconds/veh)								
South: Route 9 NB										
1 LT	0.325	9.0	3.5	12.4	0.0	6.6	0.0	6.6	9.8	12.4
2 TR	0.325	7.2	2.7	9.9	0.0	4.2	0.0	4.2	9.3	9.9
East: Route 67 WB										
1 L	0.058	10.2	0.6	10.9	0.0	8.1	0.0	8.1	16.8	10.9
2 TR	0.368	6.1	2.5	8.6	0.0	4.9	0.0	4.9	8.9	8.6
North: Route 9 SB										
1 LT	0.335	4.9	1.6	6.5	0.0	4.6	0.0	4.6	12.0	6.5
2 TR	0.335	4.8	1.6	6.4	0.0	4.2	0.0	4.2	10.3	6.4
West: Round Lake Bypass EB										
1 LTR	1.514	11.8	249.8	261.6	0.0	256.2	61.3	194.9	12.1	261.6

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

Go to Table Links (Top)

Lane Queues (Vehicles)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (veh) Nb1	Nb2	Nb	50%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	50%
South: Route 9 NB											
1 LT	0.325	0.0	0.9	0.0	0.9	0.9	0.01	0.0	100.0	0.6	0.6

2 TR	0.325	0.0	1.0	0.0	1.0	1.0	0.02	0.0	100.0	0.6	0.6
East: Route 67 WB											
1 L	0.058	0.0	0.1	0.0	0.1	0.1	0.01	0.0	100.0	0.1	0.1
2 TR	0.368	0.0	0.8	0.0	0.8	0.8	0.01	0.0	100.0	0.7	0.7
North: Route 9 SB											
1 LT	0.335	0.0	0.8	0.0	0.8	0.8	0.01	0.0	100.0	0.7	0.7
2 TR	0.335	0.0	0.8	0.0	0.8	0.8	0.01	0.0	100.0	0.7	0.7
West: Round Lake Bypass EB											
1 LTR	1.514	34.8	4.4	35.2	39.6	39.6	0.73	26.7	73.3	58.1	58.2

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queues (Distance)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	50%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	50%
South: Route 9 NB											
1 LT	0.325	0.0	23.2	0.0	23.2	23.2	0.01	0.0	100.0	14.6	14.6
2 TR	0.325	0.0	25.0	0.0	25.0	25.0	0.02	0.0	100.0	14.6	14.6
East: Route 67 WB											
1 L	0.058	0.0	2.7	0.0	2.7	2.7	0.01	0.0	100.0	2.0	2.0
2 TR	0.368	0.0	20.5	0.0	20.5	20.5	0.01	0.0	100.0	19.4	19.4
North: Route 9 SB											
1 LT	0.335	0.0	20.5	0.0	20.5	20.5	0.01	0.0	100.0	17.8	17.8
2 TR	0.335	0.0	20.4	0.0	20.4	20.4	0.01	0.0	100.0	17.8	17.8
West: Round Lake Bypass EB											
1 LTR	1.514	1017.9	128.7	1032.0	1160.8	1160.2	0.73	26.7	73.3	1702.6	1703.2

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (veh) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.325	0.9	1.1	1.6	1.8	2.2	2.4
2 TR	0.325	1.0	1.3	1.8	2.1	2.4	2.7

East: Route 67 WB							
1 L	0.058	0.1	0.1	0.2	0.2	0.2	0.2
2 TR	0.368	0.8	1.0	1.4	1.7	2.0	2.2
North: Route 9 SB							
1 LT	0.335	0.8	1.0	1.4	1.6	1.9	2.1
2 TR	0.335	0.8	1.0	1.4	1.7	1.9	2.2
West: Round Lake Bypass EB							
1 LTR	1.514	39.6	51.3	72.3	83.8	98.5	109.3

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Distance)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.325	23.2	30.0	42.3	49.0	57.6	63.9
2 TR	0.325	25.0	32.3	45.6	52.8	62.1	68.9
East: Route 67 WB							
1 L	0.058	2.7	3.6	5.0	5.8	6.8	7.6
2 TR	0.368	20.5	26.6	37.5	43.4	51.0	56.6
North: Route 9 SB							
1 LT	0.335	20.5	26.5	37.4	43.3	50.9	56.5
2 TR	0.335	20.4	26.4	37.3	43.1	50.7	56.3
West: Round Lake Bypass EB							
1 LTR	1.514	1160.2	1502.8	2118.6	2453.2	2884.9	3201.9

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Stops
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.325	0.85	0.00	0.07	0.92	147.1	0.00	0.0	0.88
2 TR	0.325	0.82	0.00	0.06	0.88	183.8	0.00	0.0	0.90
East: Route 67 WB									
1 L	0.058	0.52	0.00	0.32	0.84	17.7	0.00	0.0	0.57
2 TR	0.368	0.54	0.00	0.23	0.77	240.0	0.00	0.0	0.60
North: Route 9 SB									
1 LT	0.335	0.21	0.00	0.44	0.65	245.3	0.00	0.0	0.36
2 TR	0.335	0.21	0.00	0.40	0.61	232.6	0.00	0.0	0.36

```
---------------------------------------------------------------------
 West: Round Lake Bypass EB
 1 LTR 1.514  1.00  2.54  0.00   3.54   2832.9    9.06  7244.7   1.00
---------------------------------------------------------------------
  hig is the average value for all movements in a shared lane
  hqm is average queue move-up rate for all vehicles queued and unqueued
```

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale Fixed	Flow Scale Var	Peak Flow Factor
South: Route 9 NB								
	East	8R	Right	132	0	1.00	1.00	0.95
	North	8T	Thru	218	14	1.00	1.00	0.95
	West	3L	Left	3	3	1.00	1.00	0.95
East: Route 67 WB								
	South	1L	Left	14	7	1.00	1.00	0.95
	North	6R	Right	210	11	1.00	1.00	0.95
	West	6T	Thru	82	7	1.00	1.00	0.95
North: Route 9 SB								
	South	4T	Thru	390	21	1.00	1.00	0.95
	East	7L	Left	129	13	1.00	1.00	0.95
	West	4R	Right	193	12	1.00	1.00	0.95
West: Round Lake Bypass EB								
	South	2R	Right	5	0	1.00	1.00	0.95
	East	2T	Thru	355	145	1.00	1.00	0.95
	North	5L	Left	268	27	1.00	1.00	0.95

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

Go to Table Links (Top)

Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	3	3	0	0	0	0
8T T	0	0	218	14	0	0
8R R	0	0	0	0	132	0
East: Route 67 WB						
1L L	14	7	0	0	0	0
6T T	0	0	82	7	0	0
6R R	0	0	0	0	210	11

```
North: Route 9 SB
   7L L     129    13      0     0      0     0
   4T T       0     0    390    21      0     0
   4R R       0     0      0     0    193    12
---------------------------------------------------
West: Round Lake Bypass EB
   5L L     268    27      0     0      0     0
   2T T       0     0    355   145      0     0
   2R R       0     0      0     0      5     0
---------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

```
Intersection ID: 1
Roundabout

---------------------------------------------------
  Mov          Left         Through        Right
  ID         ----------    ----------    ----------
             Total  %HV    Total  %HV    Total  %HV
---------------------------------------------------
Demand flows in veh/h as used by the program
South: Route 9 NB
   3L L        5  50.0       0   0.0       0   0.0
   8T T        0   0.0     232   6.0       0   0.0
   8R R        0   0.0       0   0.0     132   0.0
---------------------------------------------------
East: Route 67 WB
   1L L       21  33.0       0   0.0       0   0.0
   6T T        0   0.0      89   8.0       0   0.0
   6R R        0   0.0       0   0.0     221   5.0
---------------------------------------------------
North: Route 9 SB
   7L L      142   9.0       0   0.0       0   0.0
   4T T        0   0.0     411   5.0       0   0.0
   4R R        0   0.0       0   0.0     205   6.0
---------------------------------------------------
West: Round Lake Bypass EB
   5L L      295   9.0       0   0.0       0   0.0
   2T T        0   0.0     500  29.0       0   0.0
   2R R        0   0.0       0   0.0       5   0.0
---------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: Copy of US HCM (US)
  Peak Flow Period (for performance): 15 minutes
```

```
Unit time (for volumes): 60 minutes.
HCM Delay Model option used
HCM Queue Model option used
Level of Service based on: Delay (HCM 2000)
Queue percentile: 50%
```

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Parameters Used in Cost Calculations
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

```
Intersection ID: 1
Roundabout


Pump price of fuel ($/US gal)              =     2.400
Fuel resource cost factor                  =      0.70
Ratio of running cost to fuel cost         =       3.0
Average income ($/h)                       =     19.00
Time value factor                          =      0.40
Light vehicle mass (1000 lb)               =       3.1
Heavy vehicle mass (1000 lb)               =      24.0
Light vehicle idle fuel rate (US gal/h)    =     0.360
Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

Go to Table Links (Top)

Diagnostics
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 - RC

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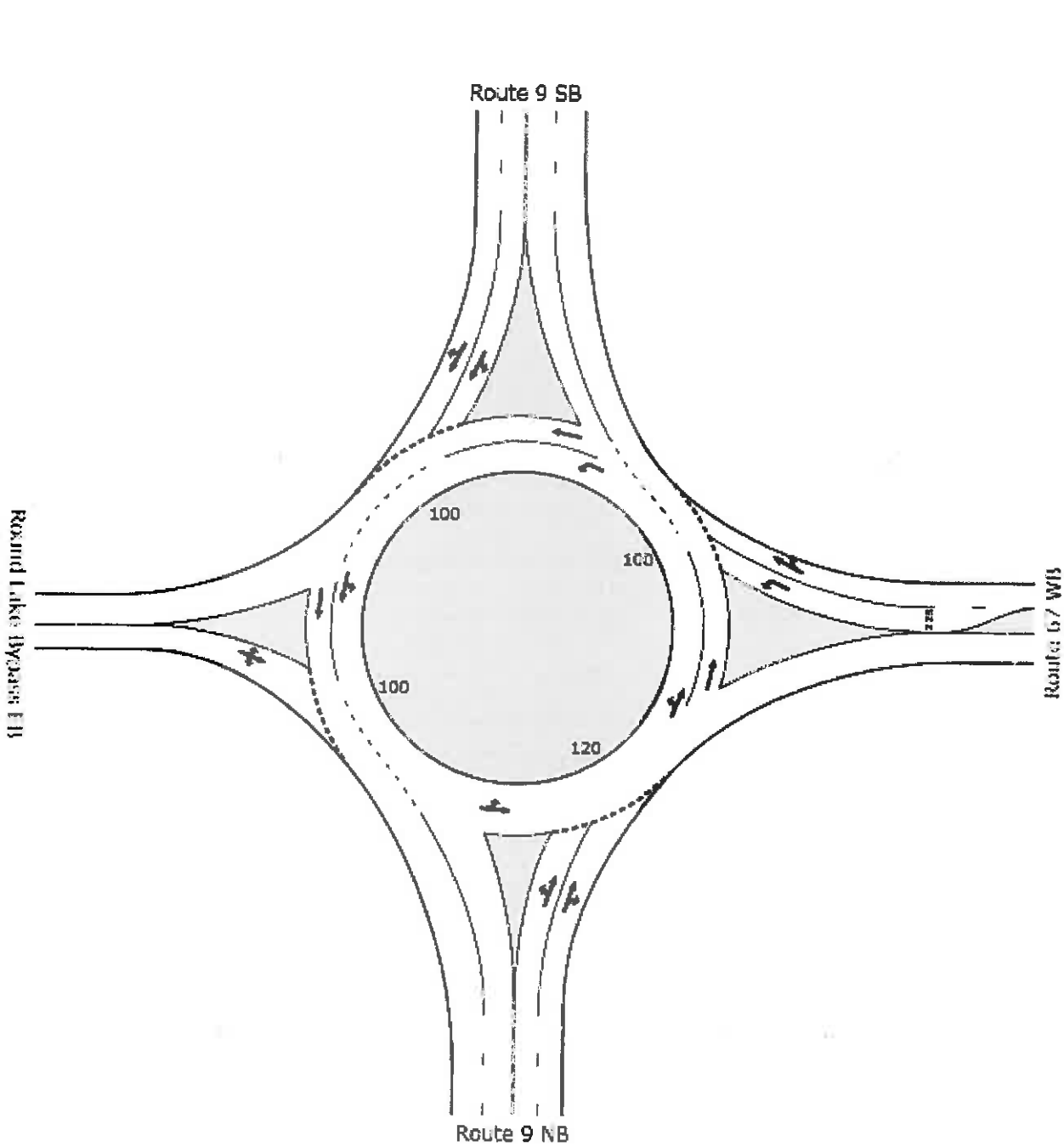
Processed: Wednesday, February 27, 2013 2:55:48 PM Copyright © 2000-2011 Akcelik and Associates Pty Ltd
SIDRA INTERSECTION 5.1.12.2089 www.sidrasolutions.com
Project: F:\Projects\2012\112-118 Global Foundries\comps\traffic\Sidra 2012\16-RT9RT67RLBYPASS.sip
8000774, CREIGHTON MANNING ENGINEERING, SINGLE


N
Round Lake Bypass EB
Route 9 SB
100
100
100
120
Route 67 WB
Route 9 NB

DETAILED OUTPUT

Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Route 9/Route 67/Round Lake Bypass
Build 2022 with Imp
AM Peak Hour
Roundabout

OUTPUT TABLE LINKS

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- Lane Queues (Distance)
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Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Cent Island Diam ft	Circ Width ft	Insc Diam. ft	Ent Rad ft	Ent Ang deg	Cir Lan	Ent Lan	Av.Ent Lane Width ft	Circulating/Exiting Stream Flow veh/h	%HV	Adjust. Flow pcu/h	%Exit Incl.	Cap. Constr. Effect	O-D Factor
South: Route 9 NB													
Environment Factor: 1.20 Entry/Circulating Flow Adjustment: Medium													
120	32	184	100	30	2	2	13.00	937	19.7	1121	0	N	0.769

```
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  532  8.1   575     0     N     0.943
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  116 14.5   133     0     N     0.974
-----------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  574  7.0   614     0     N     0.949
-----------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

Go to Table Links (Top)

Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
Turn Lane   Lane    ---- Circulating/Exiting Stream ---   Critical Gap
     No.    Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                     Rate  Speed   Dist Headway Bunched   Hdwy    Dist  Headway
                    pcu/h   mph     ft    sec              sec     ft     sec
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant 1121   21.1    99.5  1.35   0.614    5.29   164.1    3.80
Thru  1 Subdominant 1121   21.1    99.5  1.35   0.614    3.74   115.9    2.69
      2 Dominant    1121   21.1    99.5  1.35   0.614    3.39   105.1    2.43
Right 2 Dominant    1121   21.1    99.5  1.35   0.614    3.20    99.1    2.30
-----------------------------------------------------------------------------
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  575   20.3   186.2  1.68   0.447    7.54   224.0    5.00
Thru  2 Dominant     575   20.3   186.2  1.68   0.446    4.20   124.8    2.79
Right 2 Dominant     575   20.3   186.2  1.68   0.446    4.08   121.4    2.71
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  133   22.5   897.9  1.43   0.109    4.70   155.4    2.86
Thru  1 Subdominant  133   22.5   897.9  1.43   0.109    4.52   149.4    2.75
      2 Dominant     133   22.5   897.9  1.43   0.109    4.48   148.1    2.73
Right 2 Dominant     133   22.5   897.9  1.43   0.109    4.54   150.0    2.76
-----------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  614   22.1   190.3  1.30   0.385    4.75   154.1    3.17
Thru  2 Dominant     614   22.1   190.3  1.30   0.385    4.96   160.8    3.31
Right 2 Dominant     614   22.1   190.3  1.30   0.385    3.84   124.6    2.57
-----------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

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Movements

Movement Capacity Parameters
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Flow veh/h	HV %	Movement Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	5	50.0	937	19.7	1121	15	0.85	137	100	0.359
8T T	232	6.0	937	19.7	1121	645	0.85	137	100	0.359
8R R	132	0.0	937	19.7	1121	367	0.85	137	100	0.359
East: Route 67 WB										
1L L	21	33.0	532	8.1	575	319	0.85	1188	100	0.066
6T T	89	8.0	532	8.1	575	227	0.85	116	100	0.393
6R R	221	5.0	532	8.1	575	562	0.85	116	100	0.393
North: Route 9 SB										
7L L	142	9.0	116	14.5	133	423	0.85	153	100	0.336
4T T	411	5.0	116	14.5	133	1223	0.85	153	100	0.336
4R R	205	6.0	116	14.5	133	611	0.85	153	100	0.336
West: Round Lake Bypass EB										
5L L	295	9.0	574	7.0	614	639	0.85	84	100	0.461
2T T	500	29.0	574	7.0	614	596	0.85	1	100	0.839*
2R R	5	0.0	574	7.0	614	6	0.85	1	100	0.839*

* Maximum degree of saturation

Go to Table Links (Top)

Movement Performance
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Mov ID	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB									
3L L	0.02	0.02	14.1	1.01	5.3	0.12	2.5	0.1	28.2
8T T	0.85	1.03	13.3	0.93	215.0	4.92	102.3	3.3	30.8
8R R	0.42	0.51	11.6	0.93	123.0	2.57	52.3	1.7	30.3
East: Route 67 WB									
1L L	0.07	0.09	12.4	0.88	18.5	0.49	9.9	0.4	26.7
6T T	0.24	0.28	9.5	0.80	72.0	1.76	39.5	1.3	30.9
6R R	0.58	0.70	9.5	0.83	184.1	4.36	96.3	3.2	30.5
North: Route 9 SB									
7L L	0.26	0.31	6.5	0.78	111.3	2.29	61.1	2.0	30.4
4T T	0.74	0.89	6.5	0.57	235.6	6.20	181.1	5.1	35.2
4R R	0.37	0.44	6.4	0.64	130.5	3.14	89.4	2.6	34.7
West: Round Lake Bypass EB									
5L L	1.04	1.24	12.7	0.95	280.8	6.12	138.5	4.9	28.1
2T T	4.67	5.61	33.6	1.15	577.4	15.13	200.3	9.6	20.9
2R R	0.05	0.06	33.6	1.19	6.2	0.16	2.3	0.1	21.9

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Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1

Roundabout

Mov ID	Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB						
3L L	3.15	0.4	4.2	0.42	0.006	0.013
8T T	71.85	8.1	77.3	7.66	0.130	0.231
8R R	30.57	2.9	27.6	2.37	0.049	0.076
	105.58	11.5	109.2	10.45	0.185	0.321
East: Route 67 WB						
1L L	10.62	1.4	13.3	1.34	0.019	0.040
6T T	28.37	3.3	31.1	3.14	0.051	0.092
6R R	67.49	7.6	71.7	7.34	0.123	0.210
	106.48	12.2	116.1	11.82	0.192	0.341
North: Route 9 SB						
7L L	39.95	4.2	39.7	3.47	0.064	0.110
4T T	113.90	13.2	125.1	12.21	0.211	0.372
4R R	59.36	7.0	66.4	6.67	0.112	0.200
	213.22	24.4	231.2	22.35	0.387	0.683
West: Round Lake Bypass EB						
5L L	106.62	12.0	114.3	11.52	0.192	0.338
2T T	210.47	23.1	221.4	19.91	0.317	0.635
2R R	1.83	0.2	1.6	0.15	0.003	0.004
	318.91	35.3	337.2	31.58	0.512	0.977
INTERSECTION:	744.19	83.4	793.7	76.20	1.277	2.322

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Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.79	5.6	1067.0	105.94	1.393	3.319
8T T	0.44	12.6	469.3	46.53	0.792	1.404
8R R	0.36	17.9	328.7	28.15	0.586	0.909
	0.42	13.6	431.9	41.35	0.733	1.269
East: Route 67 WB						
1L L	0.67	7.1	839.1	84.52	1.176	2.539
6T T	0.45	12.0	490.4	49.50	0.801	1.443
6R R	0.44	12.7	462.4	47.34	0.791	1.352
	0.45	11.9	495.5	50.45	0.820	1.457
North: Route 9 SB						
7L L	0.41	14.6	404.0	35.32	0.650	1.123
4T T	0.39	13.7	429.3	41.90	0.724	1.278
4R R	0.41	12.8	461.1	46.35	0.782	1.387
	0.40	13.6	433.2	41.89	0.726	1.279
West: Round Lake Bypass EB						
5L L	0.48	11.5	512.5	51.68	0.863	1.515

2T T	0.65	8.7	686.7	61.75	0.983	1.969
2R R	0.50	13.6	433.8	41.43	0.813	1.208
	0.58	9.7	614.3	57.52	0.933	1.779
INTERSECTION:	0.47	11.7	505.6	48.55	0.814	1.479

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Intersection Negotiation Data
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?
South: Route 9 NB								
	East	Right	140.7	21.8	71.2	1600	488	No
	North	Thru	209.5	25.3	164.9	1600	790	No
	West	Left	66.1	16.4	259.7	1600	1122	No
East: Route 67 WB								
	South	Left	62.8	16.0	246.6	1600	1094	No
	North	Right	116.6	20.3	63.5	1600	729	No
	West	Thru	190.7	24.4	154.9	1600	804	No
North: Route 9 SB								
	South	Thru	190.7	24.4	154.9	1600	778	No
	East	Left	66.1	16.4	259.7	1600	673	No
	West	Right	116.6	20.3	63.5	1600	731	No
West: Round Lake Bypass EB								
	South	Right	116.6	20.3	63.5	1600	670	No
	East	Thru	209.5	25.3	164.9	1600	639	No
	North	Left	66.1	16.4	259.7	1600	942	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

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Movement Speeds and Geometric Delay
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	55.0	16.4	16.4	55.0	9.1		35.3	28.2	19.4
8T T	55.0	25.3	25.3	55.0	10.4		36.0	30.8	9.6
8R R	55.0	21.8	21.8	45.0	10.8		35.0	30.3	9.0
East: Route 67 WB									
1L L	45.0	16.0	16.0	55.0			31.4	26.7	16.8
6T T	45.0	24.4	24.4	55.0	12.7		34.2	30.9	8.3
6R R	45.0	20.3	20.3	55.0	12.8		34.2	30.5	9.1

North: Route 9 SB									
7L	L	55.0	16.4	16.4	45.0		34.0	30.4	15.7
4T	T	55.0	24.4	24.4	55.0		38.7	35.2	9.8
4R	R	55.0	20.3	20.3	55.0		38.4	34.7	10.8
West: Round Lake Bypass EB									
5L	L	55.0	16.4	16.4	55.0	11.6	32.8	28.1	17.2
2T	T	55.0	25.3	25.3	45.0	12.2	31.2	20.9	9.2
2R	R	55.0	20.3	20.3	55.0	13.6	32.5	21.9	10.4

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

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Lanes

Lane Performance
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 50% Back veh	Queue 50% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	163	454	0.359	14.1	0.93	0.7	19.8	1600.0
2 TR	205	572	0.359	11.6	0.93	0.8	20.5	1600.0
East: Route 67 WB								
1 L	21	319	0.066	12.4	0.88	0.1	3.1	225.0T
2 TR	311	789	0.393	9.5	0.82	0.9	22.5	1600.0
North: Route 9 SB								
1 LT	375	1118	0.336	6.5	0.65	0.8	20.8	1600.0
2 TR	382	1139	0.336	6.4	0.61	0.8	20.7	1600.0
West: Round Lake Bypass EB								
1 L	295	639	0.461	12.7	0.95	1.0	26.8	225.0T
2 TR	505	602	0.839	33.6	1.16	3.6	111.9	1600.0

T Short lane due to specification of Turn Bay

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Lane Flow and Capacity Information
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	5	158	0	163	150	454	0.359	100
2 TR	0	74	132	205	150	572	0.359	100
East: Route 67 WB								
1 L	21	0	0	21	21	319	0.066	100
2 TR	0	89	221	311	150	789	0.393	100
North: Route 9 SB								

1 LT	142	233	0	375	150	1118	0.336	100
2 TR	0	177	205	382	150	1139	0.336	100
West: Round Lake Bypass EB								
1 L	295	0	0	295	150	639	0.461	100
2 TR	0	500	5	505	150	602	0.839	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

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Lane, Approach and Intersection Performance
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (sec) 1st	2nd	Deg Sat x	Aver. Delay sec	Longest Queue ft	Shrt Lane ft
South: Route 9 NB												
1 LT	5	158		163	7				0.359	14.1	20	1600
2 TR		74	132	205	2				0.359	11.6	20	1600
	5	232	132	368	4				0.359	12.7	20	
East: Route 67 WB												
1 L	21			21	33				0.066	12.4	3	225
2 TR		89	221	311	6				0.393	9.5	22	1600
	21	89	221	332	8				0.393	9.6	22	
North: Route 9 SB												
1 LT	142	233		375	7				0.336	6.5	21	1600
2 TR		177	205	382	6				0.336	6.4	21	1600
	142	411	205	758	6				0.336	6.5	21	
West: Round Lake Bypass EB												
1 L	295			295	9				0.461	12.7	27	225
2 TR		500	5	505	29				0.839	33.6	112	1600
	295	500	5	800	21				0.839	25.9	112	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	2258	11	0.839	14.8	112

Peak flow period = 15 minutes.

Queue values in this table are 50% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

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Driver Characteristics
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec

South: Route 9 NB						
1 LT	25.0	1323	2.72	99.89	26.48	2.00
2 TR	23.0	1535	2.35	79.30	25.43	1.59
East: Route 67 WB						
1 L	NA - Short Lane					
2 TR	21.5	1318	2.73	86.04	26.17	1.90
North: Route 9 SB						
1 LT	21.4	1290	2.79	87.47	26.30	1.95
2 TR	22.2	1312	2.74	89.36	26.11	1.94
West: Round Lake Bypass EB						
1 L	NA - Short Lane					
2 TR	25.3	1090	3.30	122.34	30.74	2.47

Saturation Flow and Saturation Headway are derived from follow-up headway.

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Lane Delays
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

		Delay (seconds/veh)								
		Stop-line Delay			Acc.	Queuing		Stopd		
Lane	Deg.	1st	2nd	Total	Dec.	Total	MvUp	(Idle)	Geom	Control
No.	Satn x	d1	d2	dSL	dn	dq	dqm	di	dig	dic
South: Route 9 NB										
1 LT	0.359	9.7	4.4	14.1	0.0	8.8	0.4	8.4	9.9	14.1
2 TR	0.359	8.1	3.5	11.6	0.0	6.4	0.3	6.2	9.2	11.6
East: Route 67 WB										
1 L	0.066	11.6	0.8	12.4	0.0	9.4	0.0	9.4	16.8	12.4
2 TR	0.393	6.5	2.9	9.5	0.0	5.5	0.1	5.4	8.9	9.5
North: Route 9 SB										
1 LT	0.336	4.9	1.6	6.5	0.0	4.6	0.0	4.6	12.0	6.5
2 TR	0.336	4.8	1.6	6.4	0.0	4.2	0.0	4.2	10.3	6.4
West: Round Lake Bypass EB										
1 L	0.461	7.9	4.7	12.7	0.0	9.3	0.7	8.6	17.2	12.7
2 TR	0.839	10.2	23.5	33.6	0.0	27.5	4.7	22.8	9.2	33.6

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

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Lane Queues (Vehicles)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

	Deg.	Ovrfl.	Back of Queue (veh)		Queue	Prob.	P'ile	Cyc-Av. Queue

Lane No.	Satn x	Queue No	Nb1	Nb2	Nb	50%	Stor. Ratio	Block %	Block %	Nc	50%
South: Route 9 NB											
1 LT	0.359	0.0	0.7	0.0	0.7	0.7	0.01	0.0	100.0	0.6	0.6
2 TR	0.359	0.0	0.8	0.0	0.8	0.8	0.01	0.0	100.0	0.7	0.7
East: Route 67 WB											
1 L	0.066	0.0	0.1	0.0	0.1	0.1	0.01	0.0	100.0	0.1	0.1
2 TR	0.393	0.0	0.9	0.0	0.9	0.9	0.01	0.0	100.0	0.8	0.8
North: Route 9 SB											
1 LT	0.336	0.0	0.8	0.0	0.8	0.8	0.01	0.0	100.0	0.7	0.7
2 TR	0.336	0.0	0.8	0.0	0.8	0.8	0.01	0.0	100.0	0.7	0.7
West: Round Lake Bypass EB											
1 L	0.461	0.1	0.9	0.1	1.0	1.0	0.12	0.0	100.0	1.0	1.0
2 TR	0.839	1.1	2.2	1.5	3.6	3.6	0.07	0.0	100.0	4.7	4.7

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queues (Distance)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	50%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	50%
South: Route 9 NB											
1 LT	0.359	1.0	19.1	0.8	19.8	19.8	0.01	0.0	100.0	16.9	16.9
2 TR	0.359	0.7	19.9	0.6	20.5	20.5	0.01	0.0	100.0	16.8	16.8
East: Route 67 WB											
1 L	0.066	0.0	3.1	0.0	3.1	3.1	0.01	0.0	100.0	2.3	2.3
2 TR	0.393	0.2	22.2	0.2	22.5	22.5	0.01	0.0	100.0	21.3	21.4
North: Route 9 SB											
1 LT	0.336	0.0	20.8	0.0	20.8	20.8	0.01	0.0	100.0	17.9	17.9
2 TR	0.336	0.0	20.7	0.0	20.7	20.7	0.01	0.0	100.0	17.8	17.8
West: Round Lake Bypass EB											
1 L	0.461	2.5	24.2	2.7	26.8	26.8	0.12	0.0	100.0	27.8	27.8
2 TR	0.839	34.6	67.2	44.8	112.0	111.9	0.07	0.0	100.0	145.2	145.2

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Deg.	Percentile Back of Queue (veh)

Lane No.	Satn x	50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.359	0.7	1.0	1.4	1.6	1.9	2.1
2 TR	0.359	0.8	1.0	1.5	1.7	2.0	2.2
East: Route 67 WB							
1 L	0.066	0.1	0.1	0.2	0.2	0.2	0.3
2 TR	0.393	0.9	1.1	1.6	1.8	2.1	2.4
North: Route 9 SB							
1 LT	0.336	0.8	1.0	1.4	1.7	2.0	2.2
2 TR	0.336	0.8	1.0	1.4	1.7	2.0	2.2
West: Round Lake Bypass EB							
1 L	0.461	1.0	1.3	1.8	2.1	2.5	2.8
2 TR	0.839	3.6	4.7	6.6	7.7	9.1	10.0

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queue Percentiles (Distance)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.359	19.8	25.7	36.2	41.9	49.3	54.7
2 TR	0.359	20.5	26.5	37.4	43.3	51.0	56.6
East: Route 67 WB							
1 L	0.066	3.1	4.0	5.6	6.5	7.7	8.5
2 TR	0.393	22.5	29.1	41.0	47.5	55.9	62.0
North: Route 9 SB							
1 LT	0.336	20.8	26.9	38.0	44.0	51.7	57.4
2 TR	0.336	20.7	26.8	37.8	43.8	51.5	57.2
West: Round Lake Bypass EB							
1 L	0.461	26.8	34.7	49.0	56.7	66.7	74.0
2 TR	0.839	111.9	145.0	204.4	236.7	278.3	308.9

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Stops
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.359	0.80	0.02	0.12	0.93	152.1	0.07	10.8	0.80

2 TR	0.359	0.80	0.01	0.12	0.93	191.2	0.04	9.1	0.80
East: Route 67 WB									
1 L	0.066	0.59	0.00	0.29	0.88	18.5	0.00	0.0	0.61
2 TR	0.393	0.62	0.00	0.20	0.82	256.1	0.01	2.6	0.65
North: Route 9 SB									
1 LT	0.336	0.22	0.00	0.44	0.65	244.8	0.00	0.0	0.36
2 TR	0.336	0.21	0.00	0.39	0.61	232.6	0.00	0.0	0.36
West: Round Lake Bypass EB									
1 L	0.461	0.68	0.03	0.25	0.95	280.8	0.10	29.7	0.68
2 TR	0.839	0.91	0.20	0.05	1.16	583.6	0.66	335.6	0.91

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale Fixed	Flow Scale Var	Peak Flow Factor
South: Route 9 NB								
	East	8R	Right	132	0	1.00	1.00	0.95
	North	8T	Thru	218	14	1.00	1.00	0.95
	West	3L	Left	3	3	1.00	1.00	0.95
East: Route 67 WB								
	South	1L	Left	14	7	1.00	1.00	0.95
	North	6R	Right	210	11	1.00	1.00	0.95
	West	6T	Thru	82	7	1.00	1.00	0.95
North: Route 9 SB								
	South	4T	Thru	390	21	1.00	1.00	0.95
	East	7L	Left	129	13	1.00	1.00	0.95
	West	4R	Right	193	12	1.00	1.00	0.95
West: Round Lake Bypass EB								
	South	2R	Right	5	0	1.00	1.00	0.95
	East	2T	Thru	355	145	1.00	1.00	0.95
	North	5L	Left	268	27	1.00	1.00	0.95

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

Go to Table Links (Top)

Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV

Demand flows in veh/h as used by the program

```
South: Route 9 NB
   3L L       3     3      0     0      0     0
   8T T       0     0    218    14      0     0
   8R R       0     0      0     0    132     0
-----------------------------------------------
East: Route 67 WB
   1L L      14     7      0     0      0     0
   6T T       0     0     82     7      0     0
   6R R       0     0      0     0    210    11
-----------------------------------------------
North: Route 9 SB
   7L L     129    13      0     0      0     0
   4T T       0     0    390    21      0     0
   4R R       0     0      0     0    193    12
-----------------------------------------------
West: Round Lake Bypass EB
   5L L     268    27      0     0      0     0
   2T T       0     0    355   145      0     0
   2R R       0     0      0     0      5     0
-----------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

```
Intersection ID: 1
Roundabout

-------------------------------------------------------
  Mov          Left          Through          Right
  ID         ----------     ----------     ----------
             Total  %HV     Total  %HV     Total  %HV
-------------------------------------------------------
Demand flows in veh/h as used by the program
South: Route 9 NB
   3L L        5  50.0        0   0.0        0   0.0
   8T T        0   0.0      232   6.0        0   0.0
   8R R        0   0.0        0   0.0      132   0.0
-------------------------------------------------------
East: Route 67 WB
   1L L       21  33.0        0   0.0        0   0.0
   6T T        0   0.0       89   8.0        0   0.0
   6R R        0   0.0        0   0.0      221   5.0
-------------------------------------------------------
North: Route 9 SB
   7L L      142   9.0        0   0.0        0   0.0
   4T T        0   0.0      411   5.0        0   0.0
   4R R        0   0.0        0   0.0      205   6.0
-------------------------------------------------------
West: Round Lake Bypass EB
   5L L      295   9.0        0   0.0        0   0.0
   2T T        0   0.0      500  29.0        0   0.0
   2R R        0   0.0        0   0.0        5   0.0
-------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: Copy of US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  HCM Delay Model option used
  HCM Queue Model option used
  Level of Service based on: Delay (HCM 2000)
  Queue percentile: 50%
```

Go to Table Links (Top)

Parameters Used in Cost Calculations
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

```
Intersection ID: 1
Roundabout

   Pump price of fuel ($/US gal)              =     2.400
   Fuel resource cost factor                  =      0.70
   Ratio of running cost to fuel cost         =       3.0
   Average income ($/h)                       =     19.00
   Time value factor                          =      0.40
   Light vehicle mass (1000 lb)               =       3.1
   Heavy vehicle mass (1000 lb)               =      24.0
   Light vehicle idle fuel rate (US gal/h)    =     0.360
   Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

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Diagnostics
Site:Route 9/Route 67/Round Lake Bypass - AM Peak - Build 2022 w/Imp - RC

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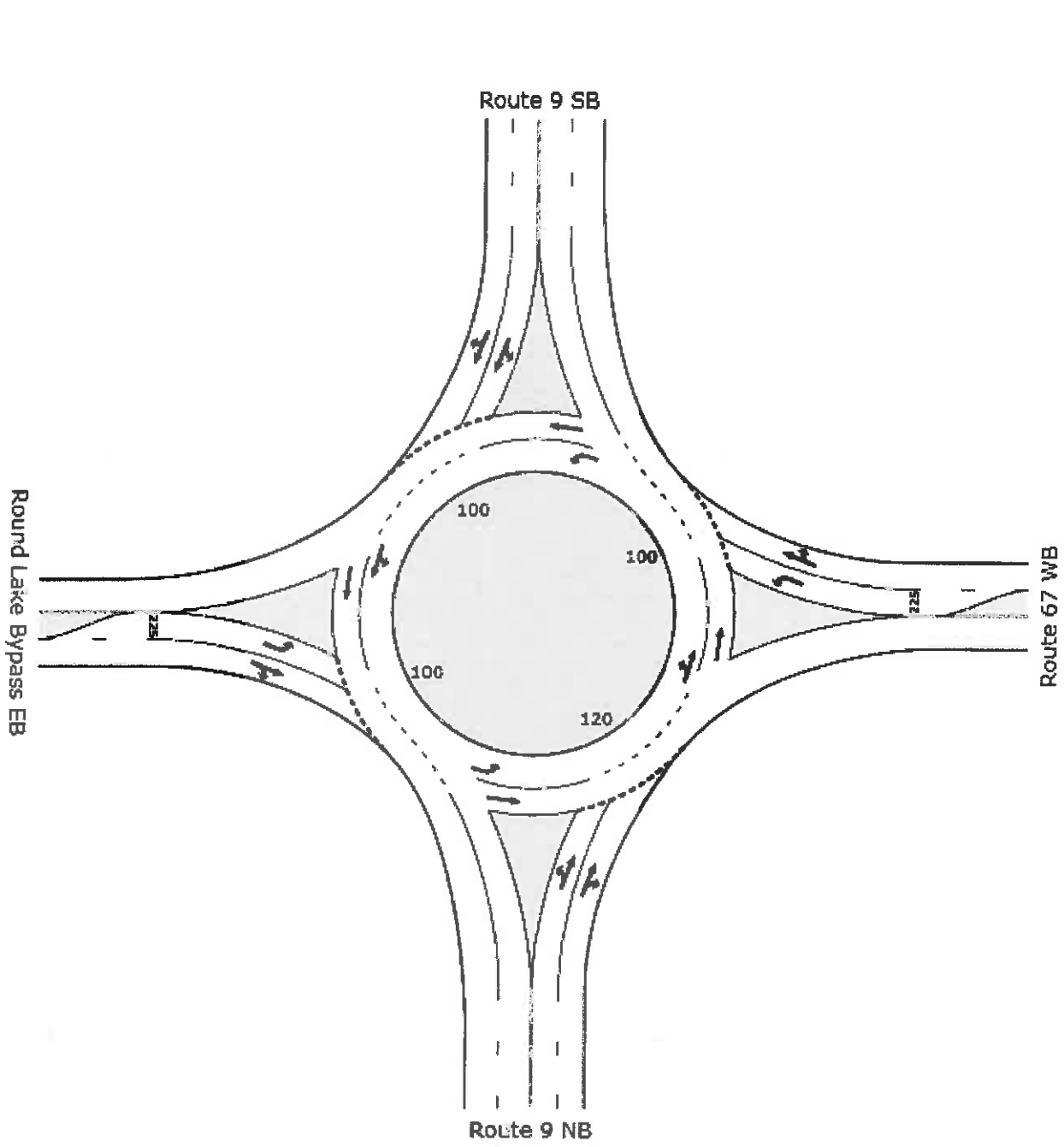
N
Route 9 SB
Round Lake Bypass EB
Route 67 WB
Route 9 NB
100
100
100
120

DETAILED OUTPUT

Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Route 9/Route 67/Round Lake Bypass
No-Build 2022
PM Peak Hour
Roundabout

OUTPUT TABLE LINKS

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Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Cent Island Diam ft	Circ Width ft	Insc Diam. ft	Ent Rad ft	Ent Ang deg	Cir Lan	Ent Lan	Av.Ent Lane Width ft	Circulating/Exiting Stream Flow veh/h	%HV	Adjust. Flow pcu/h	%Exit Incl.	Cap. Constr. Effect	O-D Factor
South: Route 9 NB													
Environment Factor: 1.20							Entry/Circulating Flow Adjustment: Medium						
120	16	152	100	30	1	2	13.00	406	4.7	425	0	N	0.965

```
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  653  1.0   660     0     N     0.920
-------------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  231  3.2   239     0     N     0.957
-------------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   1  13.00  620  1.0   626     0     N     0.931
-------------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

Go to Table Links (Top)

Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

```
Intersection ID: 1
Roundabout

-------------------------------------------------------------------------------
Turn Lane    Lane    ---- Circulating/Exiting Stream ---   Critical Gap
     No.     Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                      Rate  Speed   Dist Headway Bunched   Hdwy    Dist  Headway
                     pcu/h   mph     ft    sec              sec     ft     sec
-------------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  425   17.8   221.3  2.00   0.405    4.53   118.5    2.48
Thru  1 Subdominant  425   17.8   221.3  2.00   0.405    4.58   119.7    2.50
      2 Dominant     425   17.8   221.3  2.00   0.405    4.20   109.9    2.30
Right 2 Dominant     425   17.8   221.3  2.00   0.405    4.16   108.8    2.27
-------------------------------------------------------------------------------
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  660   23.6   188.6  1.22   0.387    5.78   199.7    3.89
Thru  2 Dominant     660   23.6   188.6  1.22   0.387    3.94   136.1    2.65
Right 2 Dominant     660   23.6   188.6  1.22   0.387    3.90   134.8    2.63
-------------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  239   22.8   505.2  1.47   0.191    4.39   147.0    2.73D
Thru  1 Subdominant  239   22.8   505.2  1.47   0.191    4.26   142.6    2.65D
      2 Dominant     239   22.8   505.2  1.47   0.191    4.26   142.6    2.65
Right 2 Dominant     239   22.8   505.2  1.47   0.191    4.35   145.6    2.70
-------------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Dominant     626   21.2   178.5  1.35   0.402    4.52   140.4    3.03
Thru  1 Dominant     626   21.2   178.5  1.35   0.402    5.20   161.2    3.48
Right 1 Dominant     626   21.2   178.5  1.35   0.402    4.48   139.0    3.00
-------------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.
  D  Subdominant lane follow-up headway was calculated as less than
     the dominant lane value and was set to the dominant lane value

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

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Movements

Movement Capacity Parameters

Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Flow veh/h	HV %	Movement Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	2	0.0	406	4.7	425	8	0.85	212	100	0.273
8T T	521	1.0	406	4.7	425	1911	0.85	212	100	0.273
8R R	16	0.0	406	4.7	425	57	0.85	212	100	0.273
East: Route 67 WB										
1L L	42	0.0	653	1.0	660	438	0.85	794	100	0.095
6T T	188	4.0	653	1.0	660	449	0.85	103	100	0.418*
6R R	141	3.0	653	1.0	660	336	0.85	103	100	0.418*
North: Route 9 SB										
7L L	203	3.0	231	3.2	239	525	0.85	120	100	0.387
4T T	375	0.0	231	3.2	239	969	0.85	120	100	0.387
4R R	240	2.0	231	3.2	239	619	0.85	120	100	0.387
West: Round Lake Bypass EB										
5L L	130	1.0	620	1.0	626	368	0.85	140	100	0.354
2T T	73	16.0	620	1.0	626	206	0.85	140	100	0.354
2R R	16	0.0	620	1.0	626	44	0.85	140	100	0.354

* Maximum degree of saturation

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Movement Performance
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Mov ID	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB									
3L L	0.00	0.00	6.7	0.88	1.8	0.04	1.0	0.0	32.1
8T T	0.92	1.11	6.4	0.70	366.6	8.43	229.6	6.4	35.8
8R R	0.03	0.03	6.1	0.73	11.3	0.24	6.2	0.2	34.4
East: Route 67 WB									
1L L	0.11	0.13	9.6	0.89	37.0	0.89	19.5	0.7	28.0
6T T	0.52	0.62	9.9	0.86	160.4	3.76	82.7	2.7	30.7
6R R	0.39	0.47	9.9	0.89	124.9	2.83	61.3	2.0	30.3
North: Route 9 SB									
7L L	0.42	0.51	7.5	0.80	162.8	3.37	87.0	2.9	29.9
4T T	0.78	0.93	7.5	0.64	240.0	5.97	165.4	4.8	34.3
4R R	0.50	0.60	7.5	0.69	166.0	3.86	104.4	3.1	33.9
West: Round Lake Bypass EB									
5L L	0.39	0.47	10.7	0.95	124.2	2.59	61.0	2.1	29.3
2T T	0.22	0.26	10.7	0.82	59.9	1.30	29.1	0.9	30.7
2R R	0.05	0.06	10.7	0.87	13.6	0.29	6.8	0.2	31.6

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Mov ID	Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB						
3L L	0.61	0.1	0.6	0.06	0.001	0.002
8T T	134.07	14.9	141.5	13.87	0.251	0.420
8R R	3.35	0.3	3.1	0.27	0.006	0.009
	138.02	15.3	145.2	14.20	0.257	0.430
East: Route 67 WB						
1L L	12.89	1.3	12.3	1.25	0.023	0.034
6T T	55.63	6.1	58.1	5.84	0.099	0.168
6R R	41.59	4.5	42.9	4.37	0.075	0.124
	110.10	12.0	113.2	11.46	0.197	0.327
North: Route 9 SB						
7L L	53.15	5.2	49.0	4.23	0.085	0.134
4T T	96.08	10.4	98.7	9.71	0.180	0.290
4R R	65.22	7.3	69.2	6.96	0.124	0.206
	214.44	22.9	217.0	20.90	0.388	0.629
West: Round Lake Bypass EB						
5L L	40.30	4.2	39.6	3.94	0.073	0.114
2T T	20.68	2.3	22.3	1.97	0.033	0.064
2R R	4.25	0.5	4.3	0.43	0.008	0.013
	65.23	7.0	66.2	6.35	0.114	0.190
INTERSECTION:	527.80	57.2	541.6	52.91	0.957	1.576

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.39	15.4	381.5	37.49	0.700	1.100
8T T	0.36	15.4	382.9	37.54	0.679	1.136
8R R	0.34	18.7	315.3	26.84	0.553	0.882
	0.36	15.4	381.1	37.26	0.676	1.129
East: Route 67 WB						
1L L	0.41	15.1	390.7	39.89	0.728	1.087
6T T	0.42	13.5	436.4	43.86	0.745	1.266
6R R	0.42	13.5	435.0	44.33	0.761	1.260
	0.42	13.7	430.4	43.56	0.749	1.242
North: Route 9 SB						
7L L	0.38	16.8	350.1	30.21	0.605	0.956
4T T	0.36	15.9	371.0	36.48	0.676	1.088
4R R	0.39	14.3	412.0	41.45	0.737	1.224
	0.37	15.6	377.9	36.41	0.677	1.096
West: Round Lake Bypass EB						

5L L	0.41	14.6	402.7	40.15	0.743	1.157
2T T	0.44	12.4	476.0	42.04	0.714	1.361
2R R	0.39	15.0	392.1	39.61	0.731	1.149
	0.42	13.9	424.0	40.68	0.733	1.217
INTERSECTION:	0.38	14.9	394.1	38.50	0.697	1.147

Go to Table Links (Top)

Intersection Negotiation Data
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?
South: Route 9 NB								
	East	Right	129.8	21.1	58.7	1600	462	No
	North	Thru	212.4	25.4	151.3	1600	736	No
	West	Left	64.0	16.2	251.3	1600	819	No
East: Route 67 WB								
	South	Left	62.8	16.0	246.6	1600	872	No
	North	Right	116.6	20.3	63.5	1600	708	No
	West	Thru	190.7	24.4	154.9	1600	768	No
North: Route 9 SB								
	South	Thru	190.7	24.4	154.9	1600	744	No
	East	Left	64.0	16.2	251.3	1600	651	No
	West	Right	116.6	20.3	63.5	1600	705	No
West: Round Lake Bypass EB								
	South	Right	129.6	21.1	63.4	1600	712	No
	East	Thru	212.4	25.4	151.3	1600	631	No
	North	Left	64.0	16.2	251.3	1600	859	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

Go to Table Links (Top)

Movement Speeds and Geometric Delay
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	55.0	16.2	16.2	55.0			35.7	32.1	16.6
8T T	55.0	25.4	25.4	55.0			37.7	35.8	9.2
8R R	55.0	21.1	21.1	45.0			36.6	34.4	9.2
East: Route 67 WB									
1L L	45.0	16.0	16.0	55.0			31.4	28.0	15.3
6T T	45.0	24.4	24.4	55.0	11.9		34.2	30.7	8.1

6R R	45.0	20.3	20.3	55.0	12.0	34.1	30.3	9.0
North: Route 9 SB								
7L L	55.0	16.2	16.2	45.0		33.7	29.9	15.4
4T T	55.0	24.4	24.4	55.0		37.8	34.3	9.5
4R R	55.0	20.3	20.3	55.0		37.7	33.9	10.6
West: Round Lake Bypass EB								
5L L	55.0	16.2	16.2	55.0	11.7	34.3	29.3	16.7
2T T	55.0	25.4	25.4	45.0	11.0	35.4	30.7	8.6
2R R	55.0	21.1	21.1	55.0	11.7	36.5	31.6	10.2

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

Go to Table Links (Top)

Lanes

Lane Performance
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 50% Back veh	Queue 50% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	254	933	0.273	6.7	0.71	0.7	16.6	1600.0
2 TR	284	1044	0.273	6.1	0.70	0.7	17.1	1600.0
East: Route 67 WB								
1 L	42	438	0.095	9.6	0.89	0.1	3.6	225.0T
2 TR	328	785	0.418	9.9	0.87	0.9	23.0	1600.0
North: Route 9 SB								
1 LT	408	1054	0.387	7.5	0.72	0.9	23.3	1600.0
2 TR	410	1059	0.387	7.5	0.67	0.9	23.3	1600.0
West: Round Lake Bypass EB								
1 LTR	219	618	0.354	10.7	0.90	0.7	17.5	1600.0

T Short lane due to specification of Turn Bay

Go to Table Links (Top)

Lane Flow and Capacity Information
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	2	252	0	254	150	933	0.273	100
2 TR	0	269	16	284	150	1044	0.273	100
East: Route 67 WB								
1 L	42	0	0	42	42	438	0.095	100
2 TR	0	188	141	328	150	785	0.418	100
North: Route 9 SB								

1 LT	203	205	0	408	150	1054	0.387	100
2 TR	0	170	240	410	150	1059	0.387	100
West: Round Lake Bypass EB								
1 LTR	130	73	16	219	150	618	0.354	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

Go to Table Links (Top)

Lane, Approach and Intersection Performance
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (sec) 1st	2nd	Deg Sat x	Aver. Delay sec	Longest Queue ft	Shrt Lane ft
South: Route 9 NB												
1 LT	2	252		254	1				0.273	6.7	17	1600
2 TR		269	16	284	1				0.273	6.1	17	1600
	2	521	16	539	1				0.273	6.4	17	
East: Route 67 WB												
1 L	42			42	0				0.095	9.6	4	225
2 TR		188	141	328	4				0.418	9.9	23	1600
	42	188	141	370	3				0.418	9.9	23	
North: Route 9 SB												
1 LT	203	205		408	1				0.387	7.5	23	1600
2 TR		170	240	410	1				0.387	7.5	23	1600
	203	375	240	818	1				0.387	7.5	23	
West: Round Lake Bypass EB												
1 LTR	130	73	16	219	6				0.354	10.7	18	1600
	130	73	16	219	6				0.354	10.7	18	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	1945	2	0.418	8.0	23

Peak flow period = 15 minutes.

Queue values in this table are 50% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

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Driver Characteristics
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec
South: Route 9 NB						

1 LT	25.4	1438	2.50	93.14	25.20	1.83
2 TR	25.2	1568	2.30	84.91	25.19	1.62
East: Route 67 WB						
1 L	NA - Short Lane					
2 TR	22.7	1364	2.64	87.70	25.71	1.87
North: Route 9 SB						
1 LT	20.3	1339	2.69	80.09	25.30	1.84
2 TR	22.0	1343	2.68	86.48	25.23	1.90
West: Round Lake Bypass EB						
1 LTR	19.6	1134	3.18	91.31	26.19	2.26

Saturation Flow and Saturation Headway are derived from follow-up headway.

Go to Table Links (Top)

Lane Delays
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
		Delay (seconds/veh)								
South: Route 9 NB										
1 LT	0.273	5.2	1.4	6.7	0.0	2.5	0.0	2.5	9.2	6.7
2 TR	0.273	4.8	1.3	6.1	0.0	2.1	0.0	2.1	9.2	6.1
East: Route 67 WB										
1 L	0.095	8.7	0.9	9.6	0.0	6.6	0.0	6.6	15.3	9.6
2 TR	0.418	6.7	3.3	9.9	0.0	5.8	0.3	5.5	8.5	9.9
North: Route 9 SB										
1 LT	0.387	5.3	2.1	7.5	0.0	5.0	0.0	5.0	12.4	7.5
2 TR	0.387	5.3	2.1	7.5	0.0	4.5	0.0	4.5	10.1	7.5
West: Round Lake Bypass EB										
1 LTR	0.354	7.6	3.2	10.7	0.0	7.6	0.1	7.5	13.5	10.7

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

Go to Table Links (Top)

Lane Queues (Vehicles)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (veh) Nb1	Nb2	Nb	50%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	50%
South: Route 9 NB											

1 LT	0.273	0.0	0.7	0.0	0.7	0.7	0.01	0.0	100.0	0.5	0.5
2 TR	0.273	0.0	0.7	0.0	0.7	0.7	0.01	0.0	100.0	0.5	0.5
East: Route 67 WB											
1 L	0.095	0.0	0.1	0.0	0.1	0.1	0.02	0.0	100.0	0.1	0.1
2 TR	0.418	0.0	0.8	0.0	0.9	0.9	0.01	0.0	100.0	0.9	0.9
North: Route 9 SB											
1 LT	0.387	0.0	0.9	0.0	0.9	0.9	0.01	0.0	100.0	0.8	0.8
2 TR	0.387	0.0	0.9	0.0	0.9	0.9	0.01	0.0	100.0	0.8	0.8
West: Round Lake Bypass EB											
1 LTR	0.354	0.0	0.7	0.0	0.7	0.7	0.01	0.0	100.0	0.7	0.7

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queues (Distance)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	50%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	50%
South: Route 9 NB											
1 LT	0.273	0.0	16.6	0.0	16.6	16.6	0.01	0.0	100.0	11.9	11.9
2 TR	0.273	0.0	17.1	0.0	17.1	17.1	0.01	0.0	100.0	12.1	12.1
East: Route 67 WB											
1 L	0.095	0.0	3.6	0.0	3.6	3.6	0.02	0.0	100.0	2.8	2.8
2 TR	0.418	1.1	21.8	1.2	23.0	23.0	0.01	0.0	100.0	23.3	23.3
North: Route 9 SB											
1 LT	0.387	0.0	23.3	0.0	23.3	23.3	0.01	0.0	100.0	21.5	21.5
2 TR	0.387	0.0	23.3	0.0	23.3	23.3	0.01	0.0	100.0	21.4	21.4
West: Round Lake Bypass EB											
1 LTR	0.354	0.3	17.3	0.3	17.6	17.5	0.01	0.0	100.0	17.1	17.1

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (veh) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.273	0.7	0.9	1.2	1.4	1.6	1.8
2 TR	0.273	0.7	0.9	1.2	1.4	1.7	1.9

East: Route 67 WB							
1 L	0.095	0.1	0.2	0.3	0.3	0.4	0.4
2 TR	0.418	0.9	1.2	1.6	1.9	2.2	2.5
North: Route 9 SB							
1 LT	0.387	0.9	1.2	1.7	1.9	2.3	2.5
2 TR	0.387	0.9	1.2	1.7	2.0	2.3	2.5
West: Round Lake Bypass EB							
1 LTR	0.354	0.7	0.9	1.2	1.4	1.7	1.8

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Distance)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.273	16.6	21.6	30.4	35.2	41.4	45.9
2 TR	0.273	17.1	22.2	31.3	36.2	42.6	47.3
East: Route 67 WB							
1 L	0.095	3.6	4.6	6.5	7.5	8.9	9.9
2 TR	0.418	23.0	29.8	42.0	48.6	57.2	63.5
North: Route 9 SB							
1 LT	0.387	23.3	30.2	42.6	49.3	58.0	64.3
2 TR	0.387	23.3	30.1	42.5	49.2	57.9	64.2
West: Round Lake Bypass EB							
1 LTR	0.354	17.5	22.7	32.0	37.1	43.6	48.4

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Stops
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.273	0.49	0.00	0.23	0.71	181.5	0.00	0.0	0.61
2 TR	0.273	0.47	0.00	0.23	0.70	198.2	0.00	0.0	0.60
East: Route 67 WB									
1 L	0.095	0.58	0.00	0.31	0.89	37.0	0.00	0.0	0.60
2 TR	0.418	0.66	0.02	0.19	0.87	285.3	0.05	15.4	0.66
North: Route 9 SB									
1 LT	0.387	0.35	0.00	0.36	0.72	293.3	0.00	0.0	0.49

2	TR	0.387	0.35	0.00	0.32	0.67	275.5	0.00	0.0	0.49
West: Round Lake Bypass EB										
1	LTR	0.354	0.65	0.00	0.25	0.90	197.7	0.02	3.6	0.65

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale Fixed	Flow Scale Var	Peak Flow Factor
South: Route 9 NB								
	East	8R	Right	16	0	1.00	1.00	0.96
	North	8T	Thru	516	5	1.00	1.00	0.96
	West	3L	Left	2	0	1.00	1.00	0.96
East: Route 67 WB								
	South	1L	Left	42	0	1.00	1.00	0.96
	North	6R	Right	136	4	1.00	1.00	0.96
	West	6T	Thru	180	7	1.00	1.00	0.96
North: Route 9 SB								
	South	4T	Thru	375	0	1.00	1.00	0.96
	East	7L	Left	197	6	1.00	1.00	0.96
	West	4R	Right	235	5	1.00	1.00	0.96
West: Round Lake Bypass EB								
	South	2R	Right	16	0	1.00	1.00	0.96
	East	2T	Thru	61	12	1.00	1.00	0.96
	North	5L	Left	129	1	1.00	1.00	0.96

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

Go to Table Links (Top)

Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	2	0	0	0	0	0
8T T	0	0	516	5	0	0
8R R	0	0	0	0	16	0
East: Route 67 WB						
1L L	42	0	0	0	0	0
6T T	0	0	180	7	0	0
6R R	0	0	0	0	136	4

```
-----------------------------------------------
North: Route 9 SB
   7L L     197     6      0     0      0     0
   4T T       0     0    375     0      0     0
   4R R       0     0      0     0    235     5
-----------------------------------------------
West: Round Lake Bypass EB
   5L L     129     1      0     0      0     0
   2T T       0     0     61    12      0     0
   2R R       0     0      0     0     16     0
-----------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

```
Intersection ID: 1
Roundabout

-------------------------------------------------------
  Mov          Left          Through         Right
  ID         ----------     ----------     ----------
             Total  %HV     Total  %HV     Total  %HV
-------------------------------------------------------
Demand flows in veh/h as used by the program
South: Route 9 NB
   3L L        2   0.0        0   0.0        0   0.0
   8T T        0   0.0      521   1.0        0   0.0
   8R R        0   0.0        0   0.0       16   0.0
-------------------------------------------------------
East: Route 67 WB
   1L L       42   0.0        0   0.0        0   0.0
   6T T        0   0.0      188   4.0        0   0.0
   6R R        0   0.0        0   0.0      141   3.0
-------------------------------------------------------
North: Route 9 SB
   7L L      203   3.0        0   0.0        0   0.0
   4T T        0   0.0      375   0.0        0   0.0
   4R R        0   0.0        0   0.0      240   2.0
-------------------------------------------------------
West: Round Lake Bypass EB
   5L L      130   1.0        0   0.0        0   0.0
   2T T        0   0.0       73  16.0        0   0.0
   2R R        0   0.0        0   0.0       16   0.0
-------------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: Copy of US HCM (US)
```

```
Peak Flow Period (for performance): 15 minutes
Unit time (for volumes): 60 minutes.
HCM Delay Model option used
HCM Queue Model option used
Level of Service based on: Delay (HCM 2000)
Queue percentile: 50%
```

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Parameters Used in Cost Calculations
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

```
Intersection ID: 1
Roundabout


   Pump price of fuel ($/US gal)              =     2.400
   Fuel resource cost factor                  =      0.70
   Ratio of running cost to fuel cost         =       3.0
   Average income ($/h)                       =     19.00
   Time value factor                          =      0.40
   Light vehicle mass (1000 lb)               =       3.1
   Heavy vehicle mass (1000 lb)               =      24.0
   Light vehicle idle fuel rate (US gal/h)    =     0.360
   Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

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Diagnostics
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - No-Build 202 - RC

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DETAILED OUTPUT

Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Route 9/Route 67/Round Lake Bypass
Build 2022
PM Peak Hour
Roundabout

OUTPUT TABLE LINKS

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Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Cent Island Diam ft	Circ Width ft	Insc Diam. ft	Ent Rad ft	Ent Ang deg	Cir Lan	Ent Lan	Av.Ent Lane Width ft	Circulating/Exiting Stream Flow veh/h	%HV	Adjust. Flow pcu/h	%Exit Incl.	Cap. Constr. Effect	O-D Factor
South: Route 9 NB													
Environment Factor: 1.20							Entry/Circulating Flow Adjustment: Medium						
120	16	152	100	30	1	2	13.00	500	5.9	529	0	N	0.929

```
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  690  1.0   696     0     N     0.903
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  596  3.1   615     0     N     0.876
-----------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   1  13.00  724  0.8   730     0     N     0.873
-----------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

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Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
Turn Lane    Lane    ---- Circulating/Exiting Stream ---   Critical Gap
      No.    Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                      Rate  Speed   Dist Headway Bunched    Hdwy    Dist  Headway
                     pcu/h   mph     ft    sec               sec     ft     sec
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  529   18.7   186.2  2.00   0.478    4.43   121.3    2.46
Thru  1 Subdominant  529   18.7   186.2  2.00   0.478    4.48   122.6    2.49
      2 Dominant     529   18.7   186.2  2.00   0.478    4.06   111.3    2.26
Right 2 Dominant     529   18.7   186.2  2.00   0.478    4.02   110.2    2.24
-----------------------------------------------------------------------------
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  696   23.2   176.2  1.24   0.410    5.70   194.4    3.86
Thru  2 Dominant     696   23.2   176.2  1.24   0.410    3.89   132.7    2.64
Right 2 Dominant     696   23.2   176.2  1.24   0.410    3.86   131.4    2.61
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  615   22.6   194.5  1.42   0.414    4.01   133.1    2.68
Thru  1 Subdominant  615   22.6   194.5  1.42   0.414    3.89   129.2    2.60
      2 Dominant     615   22.6   194.5  1.42   0.414    3.84   127.5    2.57
Right 2 Dominant     615   22.6   194.5  1.42   0.414    3.92   130.1    2.62
-----------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Dominant     730   20.7   149.4  1.54   0.500    4.39   133.0    2.99
Thru  1 Dominant     730   20.7   149.4  1.54   0.500    5.04   152.7    3.43
Right 1 Dominant     730   20.7   149.4  1.54   0.500    4.35   131.7    2.96
-----------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

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Movements

Movement Capacity Parameters
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Flow veh/h	HV %	Movement Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	2	0.0	500	5.9	529	7	0.85	168	100	0.317
8T T	526	1.0	500	5.9	529	1658	0.85	168	100	0.317
8R R	31	0.0	500	5.9	529	98	0.85	168	100	0.317
East: Route 67 WB										
1L L	125	0.0	690	1.0	696	422	0.85	187	100	0.296
6T T	469	4.0	690	1.0	696	582	0.85	5	100	0.806*
6R R	141	3.0	690	1.0	696	174	0.85	5	100	0.806*
North: Route 9 SB										
7L L	203	3.0	596	3.1	615	319	0.85	33	100	0.637
4T T	396	0.0	596	3.1	615	622	0.85	33	100	0.637
4R R	380	2.0	596	3.1	615	597	0.85	33	100	0.637
West: Round Lake Bypass EB										
5L L	161	1.0	724	0.8	730	272	0.85	43	100	0.593
2T T	135	16.0	724	0.8	730	228	0.85	43	100	0.593
2R R	16	0.0	724	0.8	730	26	0.85	43	100	0.593

* Maximum degree of saturation

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Movement Performance
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB									
3L L	0.00	0.01	8.0	0.90	1.9	0.04	1.0	0.0	31.4
8T T	1.11	1.33	7.6	0.77	403.2	9.15	231.9	6.7	34.8
8R R	0.06	0.07	7.2	0.78	24.3	0.51	12.4	0.4	33.6
East: Route 67 WB									
1L L	0.47	0.56	13.6	0.92	115.1	2.91	58.5	2.2	26.2
6T T	3.31	3.97	25.4	1.12	524.4	13.41	206.7	8.7	23.7
6R R	0.99	1.19	25.4	1.13	158.8	4.01	61.3	2.6	23.4
North: Route 9 SB									
7L L	0.89	1.07	15.8	1.04	210.7	4.51	87.0	3.4	25.9
4T T	1.73	2.08	15.7	0.98	387.3	8.73	174.6	6.0	29.0
4R R	1.65	1.98	15.6	0.99	378.0	8.36	165.6	5.7	28.8
West: Round Lake Bypass EB									
5L L	0.86	1.04	19.2	1.05	168.8	4.02	75.7	2.9	25.7
2T T	0.72	0.87	19.2	0.97	131.5	3.14	54.1	2.1	25.9
2R R	0.08	0.10	19.2	1.00	15.6	0.38	6.8	0.3	27.0

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Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1

Roundabout

Mov ID	Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB						
3L L	0.61	0.1	0.6	0.06	0.001	0.002
8T T	138.17	15.3	145.1	14.32	0.258	0.431
8R R	6.82	0.7	6.4	0.55	0.011	0.018
	145.61	16.1	152.1	14.92	0.271	0.450
East: Route 67 WB						
1L L	40.24	3.9	37.4	3.78	0.070	0.103
6T T	164.12	16.6	156.9	15.57	0.274	0.444
6R R	48.86	4.8	45.9	4.56	0.082	0.129
	253.23	25.4	240.2	23.92	0.426	0.677
North: Route 9 SB						
7L L	58.88	5.4	51.6	4.40	0.090	0.139
4T T	113.55	11.8	111.3	11.13	0.207	0.323
4R R	114.57	12.2	115.6	11.64	0.210	0.339
	287.00	29.4	278.4	27.16	0.507	0.801
West: Round Lake Bypass EB						
5L L	54.42	5.4	50.7	4.96	0.094	0.143
2T T	42.77	4.6	44.0	3.93	0.068	0.125
2R R	4.69	0.5	4.5	0.45	0.008	0.013
	101.89	10.5	99.2	9.34	0.170	0.281
INTERSECTION:	787.73	81.3	769.9	75.34	1.373	2.209

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Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.39	15.3	383.9	37.51	0.703	1.105
8T T	0.37	15.1	388.7	38.36	0.692	1.154
8R R	0.34	18.4	319.8	27.38	0.563	0.894
	0.37	15.3	385.2	37.80	0.686	1.140
East: Route 67 WB						
1L L	0.43	14.8	396.8	40.16	0.742	1.094
6T T	0.49	12.5	471.6	46.80	0.824	1.335
6R R	0.50	12.6	466.0	46.28	0.827	1.312
	0.48	12.9	457.2	45.51	0.810	1.288
North: Route 9 SB						
7L L	0.42	16.0	368.1	31.39	0.642	0.990
4T T	0.40	14.8	396.1	39.61	0.738	1.149
4R R	0.43	13.6	433.6	43.67	0.787	1.273
	0.42	14.5	404.9	39.51	0.737	1.164
West: Round Lake Bypass EB						
5L L	0.45	14.1	416.3	40.73	0.771	1.175

2T T	0.49	11.7	505.1	45.12	0.775	1.438
2R R	0.43	14.4	409.1	40.83	0.769	1.177
	0.46	13.1	451.1	42.47	0.773	1.279
INTERSECTION:	0.43	14.0	421.3	41.22	0.751	1.208

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Intersection Negotiation Data
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?
South: Route 9 NB								
	East	Right	129.8	21.1	58.7	1600	464	No
	North	Thru	212.4	25.4	151.3	1600	738	No
	West	Left	64.0	16.2	251.3	1600	818	No
East: Route 67 WB								
	South	Left	62.8	16.0	246.6	1600	872	No
	North	Right	116.6	20.3	63.5	1600	703	No
	West	Thru	190.7	24.4	154.9	1600	763	No
North: Route 9 SB								
	South	Thru	190.7	24.4	154.9	1600	748	No
	East	Left	64.0	16.2	251.3	1600	647	No
	West	Right	116.6	20.3	63.5	1600	709	No
West: Round Lake Bypass EB								
	South	Right	129.6	21.1	63.4	1600	708	No
	East	Thru	212.4	25.4	151.3	1600	625	No
	North	Left	64.0	16.2	251.3	1600	855	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

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Movement Speeds and Geometric Delay
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	55.0	16.2	16.2	55.0			35.7	31.4	16.6
8T T	55.0	25.4	25.4	55.0			37.1	34.8	9.2
8R R	55.0	21.1	21.1	45.0			36.1	33.6	9.2
East: Route 67 WB									
1L L	45.0	16.0	16.0	55.0	9.9		31.2	26.2	15.3
6T T	45.0	24.4	24.4	55.0	11.7		31.1	23.7	8.1
6R R	45.0	20.3	20.3	55.0	11.8		31.3	23.4	9.0

North: Route 9 SB								
7L L	55.0	16.2	16.2	45.0	12.2	32.4	25.9	15.4
4T T	55.0	24.4	24.4	55.0	12.4	34.6	29.0	9.5
4R R	55.0	20.3	20.3	55.0	12.3	34.9	28.8	10.6
West: Round Lake Bypass EB								
5L L	55.0	16.2	16.2	55.0	11.4	33.2	25.7	16.7
2T T	55.0	25.4	25.4	45.0	10.8	33.2	25.9	8.6
2R R	55.0	21.1	21.1	55.0	11.4	34.5	27.0	10.2

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

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Lanes

Lane Performance
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 50% veh	Back ft	Lane Length ft
South: Route 9 NB								
1 LT	261	824	0.317	8.0	0.78	0.8	20.7	1600.0
2 TR	298	939	0.317	7.2	0.76	0.9	21.6	1600.0
East: Route 67 WB								
1 L	125	422	0.296	13.6	0.92	0.5	12.4	225.0T
2 TR	609	756	0.806	25.4	1.12	3.4	86.7	1600.0
North: Route 9 SB								
1 LT	486	763	0.637	15.8	1.00	2.1	52.1	1600.0
2 TR	493	774	0.637	15.6	0.99	2.1	52.4	1600.0
West: Round Lake Bypass EB								
1 LTR	312	527	0.593	19.2	1.01	1.6	43.2	1600.0

T Short lane due to specification of Turn Bay

Go to Table Links (Top)

Lane Flow and Capacity Information
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	2	259	0	261	150	824	0.317	100
2 TR	0	267	31	298	150	939	0.317	100
East: Route 67 WB								
1 L	125	0	0	125	125	422	0.296	100
2 TR	0	469	141	609	150	756	0.806	100
North: Route 9 SB								
1 LT	203	283	0	486	150	763	0.637	100

2 TR	0	113	380	493	150	774	0.637	100

West: Round Lake Bypass EB

1 LTR	161	135	16	312	150	527	0.593	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

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Lane, Approach and Intersection Performance
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (sec) 1st	2nd	Deg Sat x	Aver. Delay sec	Longest Queue ft	Shrt Lane ft
South: Route 9 NB												
1 LT	2	259		261	1				0.317	8.0	21	1600
2 TR		267	31	298	1				0.317	7.2	22	1600
	2	526	31	559	1				0.317	7.6	22	
East: Route 67 WB												
1 L	125			125	0				0.296	13.6	12	225
2 TR		469	141	609	4				0.806	25.4	87	1600
	125	469	141	734	3				0.806	23.4	87	
North: Route 9 SB												
1 LT	203	283		486	1				0.637	15.8	52	1600
2 TR		113	380	493	2				0.637	15.6	52	1600
	203	396	380	979	1				0.637	15.7	52	
West: Round Lake Bypass EB												
1 LTR	161	135	16	312	7				0.593	19.2	43	1600
	161	135	16	312	7				0.593	19.2	43	
ALL VEHICLES				Total Flow 2585	% HV 3				Max X 0.806	Aver. Delay 16.6	Max Queue 87	

Peak flow period = 15 minutes.

Queue values in this table are 50% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

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Driver Characteristics
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec
South: Route 9 NB						
1 LT	25.4	1448	2.49	92.54	25.20	1.81

2 TR	25.0	1596	2.26	82.70	25.18	1.57
East: Route 67 WB						
1 L	NA - Short Lane					
2 TR	23.5	1369	2.63	90.55	25.75	1.88
North: Route 9 SB						
1 LT	21.0	1368	2.63	80.95	25.25	1.81
2 TR	21.2	1382	2.61	81.11	25.31	1.79
West: Round Lake Bypass EB						
1 LTR	20.4	1132	3.18	95.26	26.49	2.30

Saturation Flow and Saturation Headway are derived from follow-up headway.

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Lane Delays
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Delay (seconds/veh) Stop-line 1st d1	2nd d2	Delay Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
South: Route 9 NB										
1 LT	0.317	6.0	2.0	8.0	0.0	3.2	0.0	3.2	9.2	8.0
2 TR	0.317	5.4	1.8	7.2	0.0	2.5	0.0	2.5	9.2	7.2
East: Route 67 WB										
1 L	0.296	10.0	3.5	13.6	0.0	10.3	0.0	10.2	15.3	13.6
2 TR	0.806	8.8	16.6	25.4	0.0	19.6	3.3	16.3	8.3	25.4
North: Route 9 SB										
1 LT	0.637	7.9	7.9	15.8	0.0	11.5	1.4	10.1	11.9	15.8
2 TR	0.637	7.8	7.8	15.6	0.0	10.7	1.4	9.3	10.3	15.6
West: Round Lake Bypass EB										
1 LTR	0.593	9.8	9.5	19.2	0.0	15.2	1.6	13.6	12.8	19.2

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

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Lane Queues (Vehicles)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (veh) Nb1	Nb2	Nb	50%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	50%
South: Route 9 NB											
1 LT	0.317	0.0	0.8	0.0	0.8	0.8	0.01	0.0	100.0	0.6	0.6

2 TR	0.317	0.0	0.9	0.0	0.9	0.9	0.01	0.0	100.0	0.6	0.6
East: Route 67 WB											
1 L	0.296	0.0	0.5	0.0	0.5	0.5	0.06	0.0	100.0	0.5	0.5
2 TR	0.806	0.9	2.2	1.2	3.4	3.4	0.05	0.0	100.0	4.3	4.3
North: Route 9 SB											
1 LT	0.637	0.3	1.7	0.4	2.1	2.1	0.03	0.0	100.0	2.1	2.1
2 TR	0.637	0.3	1.7	0.4	2.1	2.1	0.03	0.0	100.0	2.1	2.1
West: Round Lake Bypass EB											
1 LTR	0.593	0.3	1.3	0.3	1.6	1.6	0.03	0.0	100.0	1.7	1.7

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queues (Distance)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	50%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	50%
South: Route 9 NB											
1 LT	0.317	0.0	20.7	0.0	20.7	20.7	0.01	0.0	100.0	14.6	14.6
2 TR	0.317	0.0	21.6	0.0	21.6	21.6	0.01	0.0	100.0	15.0	15.0
East: Route 67 WB											
1 L	0.296	0.1	12.4	0.1	12.4	12.4	0.06	0.0	100.0	11.8	11.8
2 TR	0.806	22.5	57.0	29.8	86.8	86.7	0.05	0.0	100.0	110.8	110.8
North: Route 9 SB											
1 LT	0.637	7.6	42.5	9.7	52.1	52.1	0.03	0.0	100.0	53.8	53.9
2 TR	0.637	7.6	42.8	9.7	52.5	52.4	0.03	0.0	100.0	54.1	54.2
West: Round Lake Bypass EB											
1 LTR	0.593	7.3	35.4	7.7	43.2	43.2	0.03	0.0	100.0	44.3	44.3

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (veh) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.317	0.8	1.1	1.5	1.7	2.0	2.3
2 TR	0.317	0.9	1.1	1.6	1.8	2.1	2.4

East: Route 67 WB							
1 L	0.296	0.5	0.6	0.9	1.0	1.2	1.4
2 TR	0.806	3.4	4.4	6.1	7.1	8.4	9.3
North: Route 9 SB							
1 LT	0.637	2.1	2.7	3.8	4.4	5.1	5.7
2 TR	0.637	2.1	2.7	3.8	4.4	5.2	5.7
West: Round Lake Bypass EB							
1 LTR	0.593	1.6	2.1	3.0	3.4	4.1	4.5

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Queue Percentiles (Distance)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.317	20.7	26.8	37.8	43.8	51.5	57.1
2 TR	0.317	21.6	28.0	39.4	45.7	53.7	59.6
East: Route 67 WB							
1 L	0.296	12.4	16.1	22.6	26.2	30.8	34.2
2 TR	0.806	86.7	112.3	158.3	183.3	215.6	239.3
North: Route 9 SB							
1 LT	0.637	52.1	67.5	95.1	110.2	129.5	143.8
2 TR	0.637	52.4	67.9	95.8	110.9	130.4	144.7
West: Round Lake Bypass EB							
1 LTR	0.593	43.2	55.9	78.8	91.3	107.3	119.1

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

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Lane Stops
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.317	0.61	0.00	0.17	0.78	203.7	0.00	0.0	0.71
2 TR	0.317	0.58	0.00	0.17	0.76	225.7	0.00	0.0	0.70
East: Route 67 WB									
1 L	0.296	0.67	0.00	0.25	0.92	115.1	0.01	0.7	0.67
2 TR	0.806	0.90	0.16	0.05	1.12	683.2	0.49	301.4	0.90
North: Route 9 SB									
1 LT	0.637	0.82	0.06	0.13	1.00	487.6	0.20	96.5	0.82
2 TR	0.637	0.82	0.06	0.12	0.99	488.4	0.20	96.7	0.82

West: Round Lake Bypass EB								
1 LTR	0.593	0.82	0.07	0.13	1.01	315.9	0.25	76.8	0.82

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale Fixed	Flow Scale Var	Peak Flow Factor
South: Route 9 NB								
	East	8R	Right	31	0	1.00	1.00	0.96
	North	8T	Thru	521	5	1.00	1.00	0.96
	West	3L	Left	2	0	1.00	1.00	0.96
East: Route 67 WB								
	South	1L	Left	125	0	1.00	1.00	0.96
	North	6R	Right	136	4	1.00	1.00	0.96
	West	6T	Thru	450	19	1.00	1.00	0.96
North: Route 9 SB								
	South	4T	Thru	396	0	1.00	1.00	0.96
	East	7L	Left	197	6	1.00	1.00	0.96
	West	4R	Right	373	8	1.00	1.00	0.96
West: Round Lake Bypass EB								
	South	2R	Right	16	0	1.00	1.00	0.96
	East	2T	Thru	114	22	1.00	1.00	0.96
	North	5L	Left	160	2	1.00	1.00	0.96

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

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Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV
Demand flows in veh/h as used by the program						
South: Route 9 NB						
3L L	2	0	0	0	0	0
8T T	0	0	521	5	0	0
8R R	0	0	0	0	31	0
East: Route 67 WB						
1L L	125	0	0	0	0	0
6T T	0	0	450	19	0	0
6R R	0	0	0	0	136	4

```
North: Route 9 SB
   7L L     197     6      0     0      0     0
   4T T       0     0    396     0      0     0
   4R R       0     0      0     0    373     8
-----------------------------------------------
West: Round Lake Bypass EB
   5L L     160     2      0     0      0     0
   2T T       0     0    114    22      0     0
   2R R       0     0      0     0     16     0
-----------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

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Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

```
Intersection ID: 1
Roundabout

-------------------------------------------------
  Mov          Left         Through        Right
  ID        ----------    ----------    ----------
            Total  %HV    Total  %HV    Total  %HV
-------------------------------------------------
Demand flows in veh/h as used by the program
South: Route 9 NB
   3L L        2   0.0       0   0.0       0   0.0
   8T T        0   0.0     526   1.0       0   0.0
   8R R        0   0.0       0   0.0      31   0.0
-------------------------------------------------
East: Route 67 WB
   1L L      125   0.0       0   0.0       0   0.0
   6T T        0   0.0     469   4.0       0   0.0
   6R R        0   0.0       0   0.0     141   3.0
-------------------------------------------------
North: Route 9 SB
   7L L      203   3.0       0   0.0       0   0.0
   4T T        0   0.0     396   0.0       0   0.0
   4R R        0   0.0       0   0.0     380   2.0
-------------------------------------------------
West: Round Lake Bypass EB
   5L L      161   1.0       0   0.0       0   0.0
   2T T        0   0.0     135  16.0       0   0.0
   2R R        0   0.0       0   0.0      16   0.0
-------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: Copy of US HCM (US)
  Peak Flow Period (for performance): 15 minutes
```

```
Unit time (for volumes): 60 minutes.
HCM Delay Model option used
HCM Queue Model option used
Level of Service based on: Delay (HCM 2000)
Queue percentile: 50%
```

Go to Table Links (Top)

Parameters Used in Cost Calculations
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

```
Intersection ID: 1
Roundabout
```

Pump price of fuel ($/US gal)	=	2.400
Fuel resource cost factor	=	0.70
Ratio of running cost to fuel cost	=	3.0
Average income ($/h)	=	19.00
Time value factor	=	0.40
Light vehicle mass (1000 lb)	=	3.1
Heavy vehicle mass (1000 lb)	=	24.0
Light vehicle idle fuel rate (US gal/h)	=	0.360
Heavy vehicle idle fuel rate (US gal/h)	=	0.530

Go to Table Links (Top)

Diagnostics
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 - RC

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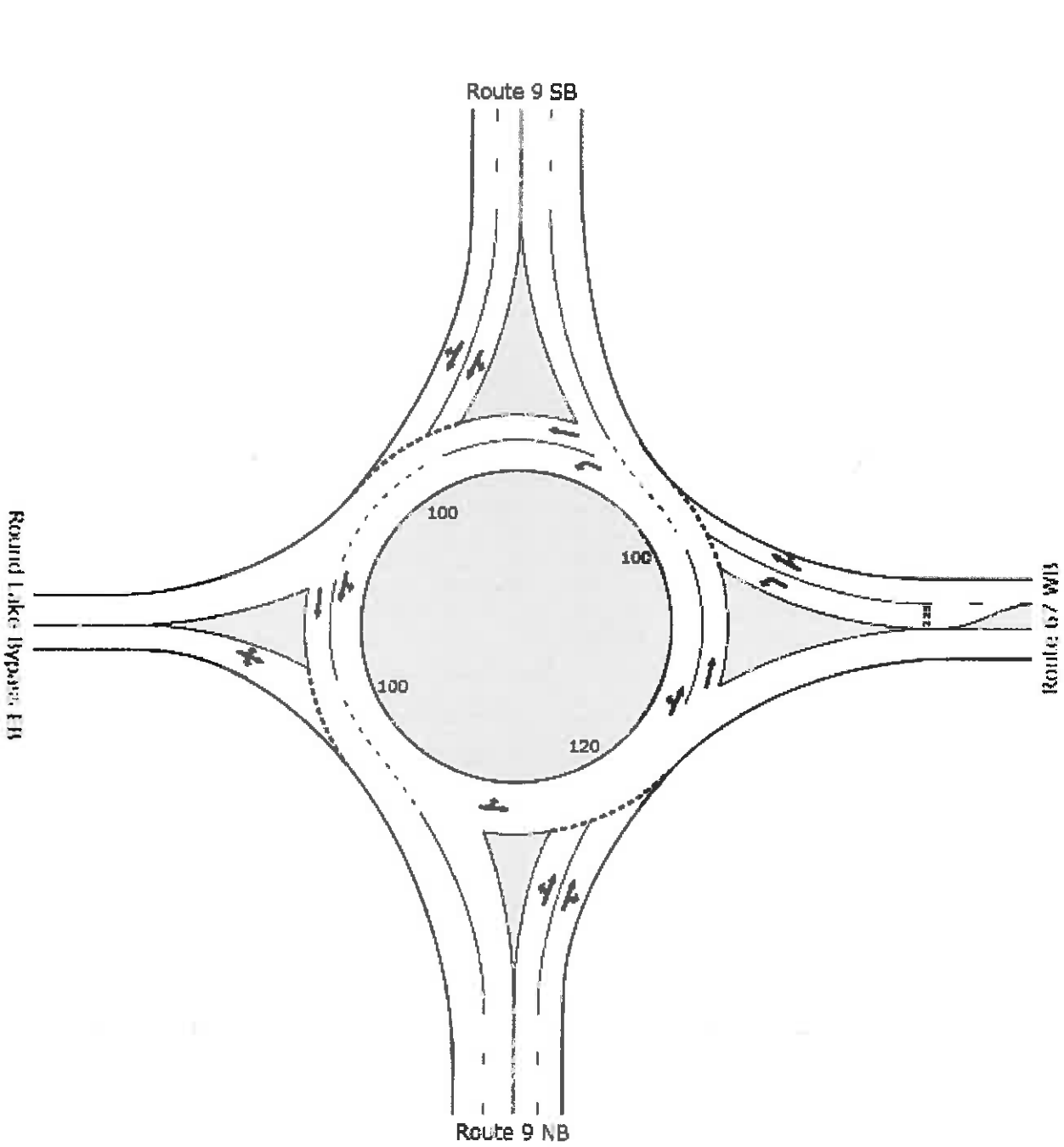
Processed: Wednesday, February 27, 2013 2:55:49 PM Copyright © 2000-2011 Akcelik and Associates Pty Ltd
SIDRA INTERSECTION 5.1.12.2089 www.sidrasolutions.com
Project: F:\Projects\2012\112-118 Global Foundries\comps\traffic\Sidra 2012\16-RT9RT67RLBYPASS.sip
8000774, CREIGHTON MANNING ENGINEERING, SINGLE


N
Round Lake Bypass EB
Route 9 SB
100
100
100
120
Route 67 WB
Route 9 NB

DETAILED OUTPUT

Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Route 9/Route 67/Round Lake Bypass
Build 2022 with Imp
PM Peak Hour
Roundabout

OUTPUT TABLE LINKS

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Roundabouts

Roundabout Basic Parameters
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Cent Island Diam ft	Circ Width ft	Insc Diam. ft	Ent Rad ft	Ent Ang deg	Cir Lan	Ent Lan	Av.Ent Lane Width ft	Circulating/Exiting Stream Flow veh/h	%HV	Adjust. Flow pcu/h	%Exit Incl.	Cap. Constr. Effect	O-D Factor
South: Route 9 NB													
Environment Factor: 1.20							Entry/Circulating Flow Adjustment: Medium						
120	32	184	100	30	2	2	13.00	500	5.9	529	0	N	0.946

```
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  690  1.0   696     0     N     0.921
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  596  3.1   615     0     N     0.878
-----------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
 100    32   164  100  30   2   2  13.00  724  0.8   730     0     N     0.873
-----------------------------------------------------------------------------
  HV Method for Gap Acceptance: Include HV Effect for all percentages
  Roundabout Capacity Model: SIDRA Standard
```

Go to Table Links (Top)

Roundabout Gap Acceptance Parameters
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

```
Intersection ID: 1
Roundabout

-----------------------------------------------------------------------------
Turn Lane    Lane    ---- Circulating/Exiting Stream ---   Critical Gap
      No.    Type     Flow  Aver    Aver In-Bnch  Prop     ------------  Foll-up
                      Rate  Speed   Dist Headway  Bunched   Hdwy    Dist  Headway
                     pcu/h   mph     ft    sec               sec     ft     sec
-----------------------------------------------------------------------------
South: Route 9 NB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  529   18.8   187.3  1.40   0.364    3.93   108.2    2.58
Thru  1 Subdominant  529   18.8   187.3  1.40   0.364    3.97   109.2    2.61
      2 Dominant     529   18.8   187.3  1.40   0.364    3.86   106.5    2.54
Right 2 Dominant     529   18.8   187.3  1.40   0.364    3.83   105.4    2.52
-----------------------------------------------------------------------------
East: Route 67 WB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  696   23.2   175.8  1.26   0.415    5.70   193.9    3.86
Thru  2 Dominant     696   23.2   175.8  1.26   0.415    3.89   132.4    2.64
Right 2 Dominant     696   23.2   175.8  1.26   0.415    3.86   131.1    2.61
-----------------------------------------------------------------------------
North: Route 9 SB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Subdominant  615   22.6   194.5  1.42   0.414    4.01   133.1    2.68
Thru  1 Subdominant  615   22.6   194.5  1.42   0.414    3.89   129.2    2.60
      2 Dominant     615   22.6   194.5  1.42   0.414    3.84   127.5    2.57
Right 2 Dominant     615   22.6   194.5  1.42   0.414    3.92   130.1    2.62
-----------------------------------------------------------------------------
West: Round Lake Bypass EB
  Environment Factor: 1.20   Entry/Circulating Flow Adjustment: Medium
Left  1 Dominant     730   20.7   149.8  1.54   0.500    3.74   113.7    2.55
Thru  2 Subdominant  730   20.7   149.8  1.54   0.500    4.43   134.6    3.02
Right 2 Subdominant  730   20.7   149.8  1.54   0.500    3.82   116.0    2.60
-----------------------------------------------------------------------------
  Roundabout Capacity Model: SIDRA Standard
  Priority sharing is implied for some movements (Follow-up Headway plus
  Intra-bunch Headway is larger than the Critical Gap).  The O-D Factor
  (Roundabout Basic Parameters table) allows for priority sharing and priority emphasis.

  Dist (Distance): Spacing, i.e. distance between the front ends of two
                   successive vehicles across all lanes in the circulating
                   or exiting stream
```

Go to Table Links (Top)

Movements

Movement Capacity Parameters
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Mov ID	Demand Flow veh/h	HV %	Opposing Flow veh/h	HV %	Movement Adjust. Flow pcu/h	Total Cap. veh/h	Prac. Deg. Satn xp	Prac. Spare Cap. %	Lane Util %	Deg. Satn x
South: Route 9 NB										
3L L	2	0.0	500	5.9	529	7	0.85	173	100	0.311
8T T	526	1.0	500	5.9	529	1692	0.85	173	100	0.311
8R R	31	0.0	500	5.9	529	101	0.85	173	100	0.311
East: Route 67 WB										
1L L	125	0.0	690	1.0	696	430	0.85	193	100	0.290
6T T	469	4.0	690	1.0	696	592	0.85	7	100	0.791*
6R R	141	3.0	690	1.0	696	178	0.85	7	100	0.791*
North: Route 9 SB										
7L L	203	3.0	596	3.1	615	320	0.85	34	100	0.635
4T T	396	0.0	596	3.1	615	623	0.85	34	100	0.635
4R R	380	2.0	596	3.1	615	599	0.85	34	100	0.635
West: Round Lake Bypass EB										
5L L	161	1.0	724	0.8	730	729	0.85	284	100	0.222
2T T	135	16.0	724	0.8	730	523	0.85	229	100	0.259
2R R	16	0.0	724	0.8	730	60	0.85	229	100	0.259

* Maximum degree of saturation

Go to Table Links (Top)

Movement Performance
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Mov ID	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Eff. Stop Rate	Total Stops	Perf. Index	Tot.Trav. Distance (veh-mi/h)	Tot.Trav. Time (veh-h/h)	Aver. Speed (mph)
South: Route 9 NB									
3L L	0.00	0.01	7.5	0.94	2.0	0.04	1.0	0.0	31.5
8T T	1.07	1.29	7.4	0.76	399.9	8.68	232.4	6.7	34.9
8R R	0.06	0.08	7.2	0.78	24.3	0.49	12.4	0.4	33.5
East: Route 67 WB									
1L L	0.46	0.55	13.2	0.92	114.6	2.87	58.5	2.2	26.4
6T T	3.11	3.73	23.9	1.10	516.1	13.04	206.7	8.5	24.2
6R R	0.93	1.12	23.9	1.11	156.6	3.90	61.3	2.6	24.0
North: Route 9 SB									
7L L	0.89	1.06	15.7	1.04	210.4	4.50	87.3	3.4	26.0
4T T	1.72	2.06	15.6	0.98	386.6	8.71	174.6	6.0	29.1
4R R	1.64	1.97	15.5	0.99	377.5	8.33	165.6	5.7	28.9
West: Round Lake Bypass EB									
5L L	0.33	0.40	7.5	0.88	141.8	2.96	75.9	2.5	30.8
2T T	0.36	0.43	9.6	0.85	115.4	2.44	54.2	1.7	32.0
2R R	0.04	0.05	9.6	0.87	13.6	0.29	6.8	0.2	32.8

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost (Total)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1

Roundabout

Mov ID	Cost Total $/h	Fuel Total gal/h	CO2 Total kg/h	CO Total kg/h	HC Total kg/h	NOX Total kg/h
South: Route 9 NB						
3L L	0.61	0.1	0.6	0.06	0.001	0.002
8T T	137.14	15.1	143.3	13.97	0.254	0.423
8R R	6.77	0.7	6.3	0.53	0.011	0.017
	144.52	15.9	150.2	14.56	0.266	0.442
East: Route 67 WB						
1L L	40.10	3.9	37.3	3.78	0.070	0.103
6T T	161.71	16.4	155.9	15.49	0.272	0.442
6R R	48.16	4.8	45.7	4.55	0.081	0.129
	249.97	25.2	238.8	23.82	0.422	0.674
North: Route 9 SB						
7L L	58.92	5.4	51.6	4.39	0.090	0.139
4T T	113.40	11.8	111.2	11.11	0.207	0.323
4R R	114.44	12.2	115.5	11.64	0.210	0.339
	286.76	29.4	278.3	27.14	0.507	0.800
West: Round Lake Bypass EB						
5L L	48.49	5.2	48.8	4.95	0.090	0.141
2T T	38.08	4.4	41.5	3.64	0.061	0.119
2R R	4.21	0.5	4.3	0.43	0.008	0.013
	90.77	10.0	94.5	9.02	0.160	0.273
INTERSECTION:	772.02	80.4	761.8	74.54	1.355	2.190

Go to Table Links (Top)

Fuel Consumption, Emissions and Cost (Rate)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Mov ID	Cost Rate $/mi	Fuel Eff. mpg	CO2 Rate g/km	CO Rate g/km	HC Rate g/km	NOX Rate g/km
South: Route 9 NB						
3L L	0.39	15.4	381.6	37.43	0.701	1.097
8T T	0.37	15.4	383.1	37.36	0.680	1.131
8R R	0.34	18.7	314.6	26.51	0.552	0.874
	0.37	15.5	379.6	36.82	0.673	1.118
East: Route 67 WB						
1L L	0.43	14.8	396.2	40.12	0.741	1.093
6T T	0.49	12.6	468.5	46.56	0.817	1.330
6R R	0.49	12.7	463.2	46.13	0.821	1.308
	0.48	13.0	454.5	45.32	0.804	1.283
North: Route 9 SB						
7L L	0.42	16.0	367.1	31.26	0.639	0.986
4T T	0.40	14.9	395.8	39.56	0.737	1.148
4R R	0.43	13.6	433.4	43.65	0.787	1.272
	0.42	14.5	404.5	39.45	0.736	1.163
West: Round Lake Bypass EB						
5L L	0.40	14.7	399.5	40.56	0.740	1.157

2T T	0.44	12.5	475.0	41.66	0.702	1.364
2R R	0.38	15.0	390.9	38.88	0.716	1.150
	0.41	13.7	429.0	40.91	0.724	1.239
INTERSECTION:	0.42	14.1	416.4	40.74	0.741	1.197

Go to Table Links (Top)

Intersection Negotiation Data
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Turn	Negn Radius ft	Negn Speed mph	Negn Dist. ft	Appr. Dist. ft	Downstream Distance ft	User Spec?
South: Route 9 NB								
	East	Right	140.7	21.8	71.2	1600	472	No
	North	Thru	209.5	25.3	164.9	1600	742	No
	West	Left	66.1	16.4	259.7	1600	828	No
East: Route 67 WB								
	South	Left	62.8	16.0	246.6	1600	872	No
	North	Right	116.6	20.3	63.5	1600	703	No
	West	Thru	190.7	24.4	154.9	1600	763	No
North: Route 9 SB								
	South	Thru	190.7	24.4	154.9	1600	748	No
	East	Left	66.1	16.4	259.7	1600	655	No
	West	Right	116.6	20.3	63.5	1600	709	No
West: Round Lake Bypass EB								
	South	Right	116.6	20.3	63.5	1600	674	No
	East	Thru	209.5	25.3	164.9	1600	589	No
	North	Left	66.1	16.4	259.7	1600	888	No

Maximum Negotiation (Design) Speed = 30.0 mph

Downstream distance is distance travelled from the stopline until exit cruise speed is reached (includes negotiation distance). Acceleration distance is weighted for light and heavy vehicles. The same distance applies for both stopped and unstopped vehicles.

Go to Table Links (Top)

Movement Speeds and Geometric Delay
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Mov ID	App. Speeds Cruise	App. Speeds Negn	Exit Speeds Negn	Exit Speeds Cruise	Queue Move-up 1st Grn	Queue Move-up 2nd Grn	Av. Section Spd Running	Av. Section Spd Overall	Geom Delay sec
South: Route 9 NB									
3L L	55.0	16.4	16.4	55.0			35.6	31.5	16.7
8T T	55.0	25.3	25.3	55.0			37.8	34.9	9.3
8R R	55.0	21.8	21.8	45.0			36.7	33.5	9.0
East: Route 67 WB									
1L L	45.0	16.0	16.0	55.0			31.2	26.4	15.3
6T T	45.0	24.4	24.4	55.0	11.8		31.3	24.2	8.1
6R R	45.0	20.3	20.3	55.0	11.8		31.5	24.0	9.0

North: Route 9 SB								
7L L	55.0	16.4	16.4	45.0	12.2	32.3	26.0	15.4
4T T	55.0	24.4	24.4	55.0	12.4	34.7	29.1	9.5
4R R	55.0	20.3	20.3	55.0	12.3	34.9	28.9	10.6
West: Round Lake Bypass EB								
5L L	55.0	16.4	16.4	55.0		33.3	30.8	16.7
2T T	55.0	25.3	25.3	45.0		36.0	32.0	8.7
2R R	55.0	20.3	20.3	55.0		37.2	32.8	10.4

"Running Speed" is the average speed excluding stopped periods.
HCM Delay Formula option used: Geometric Delay is not included in Control Delay.

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Lanes

Lane Performance
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Flow veh/h	Cap veh/h	Deg. Satn x	Aver. Delay sec	Eff. Stop Rate	Queue 50% Back veh	Queue 50% Back ft	Lane Length ft
South: Route 9 NB								
1 LT	275	884	0.311	7.5	0.76	0.6	15.4	1600.0
2 TR	285	916	0.311	7.2	0.76	0.6	15.5	1600.0
East: Route 67 WB								
1 L	125	430	0.290	13.2	0.92	0.5	11.9	225.0T
2 TR	609	770	0.791	23.9	1.10	3.2	82.5	1600.0
North: Route 9 SB								
1 LT	486	766	0.635	15.7	1.00	2.0	51.7	1600.0
2 TR	493	776	0.635	15.5	0.99	2.1	52.1	1600.0
West: Round Lake Bypass EB								
1 L	161	729	0.222	7.5	0.88	0.5	11.4	225.0T
2 TR	151	584	0.259	9.6	0.85	0.5	14.0	1600.0

T Short lane due to specification of Turn Bay

Go to Table Links (Top)

Lane Flow and Capacity Information
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Dem Flow (veh/h) Lef	Thru	Rig	Tot	Min Cap veh/h	Tot Cap veh/h	Deg. Satn x	Lane Util %
South: Route 9 NB								
1 LT	2	273	0	275	150	884	0.311	100
2 TR	0	253	31	285	150	916	0.311	100
East: Route 67 WB								
1 L	125	0	0	125	125	430	0.290	100
2 TR	0	469	141	609	150	770	0.791	100
North: Route 9 SB								

1 LT	203	283	0	486	150	766	0.635	100
2 TR	0	113	380	493	150	776	0.635	100
West: Round Lake Bypass EB								
1 L	161	0	0	161	150	729	0.222	100
2 TR	0	135	16	151	150	584	0.259	100

The capacity value for priority and continuous movements is obtained by adjusting the basic saturation flow for heavy vehicle and turning vehicle effects. Saturation flow scale applies if specified.

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Lane, Approach and Intersection Performance
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (sec) 1st	2nd	Deg Sat x	Aver. Delay sec	Longest Queue ft	Shrt Lane ft
South: Route 9 NB												
1 LT	2	273		275	1				0.311	7.5	15	1600
2 TR		253	31	285	1				0.311	7.2	16	1600
	2	526	31	559	1				0.311	7.3	16	
East: Route 67 WB												
1 L	125			125	0				0.290	13.2	12	225
2 TR		469	141	609	4				0.791	23.9	83	1600
	125	469	141	734	3				0.791	22.1	83	
North: Route 9 SB												
1 LT	203	283		486	1				0.635	15.7	52	1600
2 TR		113	380	493	2				0.635	15.5	52	1600
	203	396	380	979	1				0.635	15.6	52	
West: Round Lake Bypass EB												
1 L	161			161	1				0.222	7.5	11	225
2 TR		135	16	151	14				0.259	9.6	14	1600
	161	135	16	312	7				0.259	8.5	14	
ALL VEHICLES				Total Flow 2585	% HV 3				Max X 0.791	Aver. Delay 14.8	Max Queue 83	

Peak flow period = 15 minutes.

Queue values in this table are 50% queue (feet)
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Go to Table Links (Top)

Driver Characteristics
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Satn Speed mph	Satn Flow veh/h	Satn Hdwy sec	Satn Spacing ft	Average Queue Space ft	Driver Response Time sec

South: Route 9 NB						
1 LT	25.2	1380	2.61	96.61	25.20	1.93
2 TR	24.9	1417	2.54	92.86	25.18	1.85
East: Route 67 WB						
1 L	NA - Short Lane					
2 TR	23.5	1369	2.63	90.55	25.75	1.88
North: Route 9 SB						
1 LT	21.1	1368	2.63	81.28	25.25	1.81
2 TR	21.2	1382	2.61	81.11	25.31	1.79
West: Round Lake Bypass EB						
1 L	NA - Short Lane					
2 TR	24.8	1211	2.97	108.10	27.87	2.21

Saturation Flow and Saturation Headway are derived from follow-up headway.

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Lane Delays
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Delay (seconds/veh) Stop-line Delay 1st d1	2nd d2	Total dSL	Acc. Dec. dn	Queuing Total dq	MvUp dqm	Stopd (Idle) di	Geom dig	Control dic
South: Route 9 NB										
1 LT	0.311	5.6	1.8	7.5	0.0	3.6	0.0	3.6	9.4	7.5
2 TR	0.311	5.5	1.8	7.2	0.0	3.4	0.0	3.4	9.3	7.2
East: Route 67 WB										
1 L	0.290	9.8	3.4	13.2	0.0	10.0	0.0	10.0	15.3	13.2
2 TR	0.791	8.6	15.2	23.9	0.0	18.2	3.1	15.1	8.3	23.9
North: Route 9 SB										
1 LT	0.635	7.9	7.8	15.7	0.0	11.4	1.4	10.0	12.0	15.7
2 TR	0.635	7.8	7.7	15.5	0.0	10.6	1.4	9.2	10.3	15.5
West: Round Lake Bypass EB										
1 L	0.222	6.0	1.4	7.5	0.0	4.1	0.0	4.1	16.7	7.5
2 TR	0.259	7.5	2.1	9.6	0.0	5.0	0.0	5.0	8.9	9.6

HCM Delay Formula option used:
(i) Control Delay does not include Geometric Delay,
(ii) Stop-line Delay is treated as being same as Control Delay.
dSL: Stop-line delay (=d1+d2)
dn: Average stop-start delay for all vehicles queued and unqueued
dq: Queuing delay (the part of the stop-line delay that includes stopped delay and queue move-up delay)
dqm: Queue move-up delay
di: Stopped delay (stopped (idling) time at near-zero speed)
dig: Geometric delay
dic: Intersection control delay (sum of stop-line and geometric delays)

Go to Table Links (Top)

Lane Queues (Vehicles)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

	Deg.	Ovrfl.	Back of Queue (veh)			Queue	Prob.	P'ile	Cyc-Av. Queue

Lane No.	Satn x	Queue No	Nb1	Nb2	Nb	50%	Stor. Ratio	Block %	Block %	Nc	50%
South: Route 9 NB											
1 LT	0.311	0.0	0.6	0.0	0.6	0.6	0.01	0.0	100.0	0.6	0.6
2 TR	0.311	0.0	0.6	0.0	0.6	0.6	0.01	0.0	100.0	0.6	0.6
East: Route 67 WB											
1 L	0.290	0.0	0.5	0.0	0.5	0.5	0.05	0.0	100.0	0.5	0.5
2 TR	0.791	0.8	2.1	1.1	3.2	3.2	0.05	0.0	100.0	4.0	4.0
North: Route 9 SB											
1 LT	0.635	0.3	1.7	0.4	2.0	2.0	0.03	0.0	100.0	2.1	2.1
2 TR	0.635	0.3	1.7	0.4	2.1	2.1	0.03	0.0	100.0	2.1	2.1
West: Round Lake Bypass EB											
1 L	0.222	0.0	0.5	0.0	0.5	0.5	0.05	0.0	100.0	0.3	0.3
2 TR	0.259	0.0	0.5	0.0	0.5	0.5	0.01	0.0	100.0	0.4	0.4

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queues (Distance)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Ovrfl. Queue No	Back of Queue (ft) Nb1	Nb2	Nb	50%	Queue Stor. Ratio	Prob. Block %	P'ile Block %	Cyc-Av. Queue Nc	50%
South: Route 9 NB											
1 LT	0.311	0.0	15.4	0.0	15.4	15.4	0.01	0.0	100.0	14.3	14.3
2 TR	0.311	0.0	15.6	0.0	15.6	15.5	0.01	0.0	100.0	14.4	14.4
East: Route 67 WB											
1 L	0.290	0.0	12.0	0.0	12.0	11.9	0.05	0.0	100.0	11.5	11.5
2 TR	0.791	20.9	54.8	27.8	82.6	82.5	0.05	0.0	100.0	104.1	104.1
North: Route 9 SB											
1 LT	0.635	7.6	42.2	9.6	51.8	51.7	0.03	0.0	100.0	53.5	53.5
2 TR	0.635	7.5	42.5	9.6	52.1	52.1	0.03	0.0	100.0	53.8	53.8
West: Round Lake Bypass EB											
1 L	0.222	0.0	11.4	0.0	11.4	11.4	0.05	0.0	100.0	8.4	8.4
2 TR	0.259	0.0	14.0	0.0	14.0	14.0	0.01	0.0	100.0	11.2	11.2

HCM Delay Formula option used:
Cycle-Average Queue is calculated using average delay from the HCM equation.
(i.e. HCM delays are treated as stop-line delays for this purpose).
SIDRA Standard models are used for Back of Queue estimation since
HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Vehicles)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Deg. Percentile Back of Queue (veh)

Lane No.	Satn x	50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.311	0.6	0.8	1.1	1.3	1.5	1.7
2 TR	0.311	0.6	0.8	1.1	1.3	1.5	1.7
East: Route 67 WB							
1 L	0.290	0.5	0.6	0.9	1.0	1.2	1.3
2 TR	0.791	3.2	4.2	5.9	6.8	8.0	8.8
North: Route 9 SB							
1 LT	0.635	2.0	2.7	3.7	4.3	5.1	5.7
2 TR	0.635	2.1	2.7	3.8	4.4	5.1	5.7
West: Round Lake Bypass EB							
1 L	0.222	0.5	0.6	0.8	1.0	1.1	1.3
2 TR	0.259	0.5	0.7	0.9	1.1	1.3	1.4

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Queue Percentiles (Distance)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	Percentile Back of Queue (feet) 50%	70%	85%	90%	95%	98%
South: Route 9 NB							
1 LT	0.311	15.4	20.0	28.2	32.6	38.4	42.6
2 TR	0.311	15.5	20.1	28.4	32.9	38.7	42.9
East: Route 67 WB							
1 L	0.290	11.9	15.5	21.8	25.3	29.7	33.0
2 TR	0.791	82.5	106.9	150.7	174.5	205.2	227.8
North: Route 9 SB							
1 LT	0.635	51.7	67.0	94.5	109.4	128.6	142.8
2 TR	0.635	52.1	67.4	95.1	110.1	129.5	143.7
West: Round Lake Bypass EB							
1 L	0.222	11.4	14.8	20.9	24.2	28.4	31.5
2 TR	0.259	14.0	18.2	25.6	29.7	34.9	38.7

SIDRA Standard models are used for Back of Queue estimation since HCM only gives Cycle-Average Queues for unsignalised intersections.

Go to Table Links (Top)

Lane Stops
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Lane No.	Deg. Satn x	-- Effective Stop Rate -- he1	he2	Geom. hig	Overall h	Total Stops H	Queue Move-up Rate hqm	Total Queue Move-ups Hqm	Prop. Queued pq
South: Route 9 NB									
1 LT	0.311	0.52	0.00	0.25	0.76	210.1	0.00	0.0	0.58

2 TR	0.311	0.51	0.00	0.25	0.76	216.1	0.00	0.0	0.57
East: Route 67 WB									
1 L	0.290	0.66	0.00	0.26	0.92	114.6	0.00	0.0	0.66
2 TR	0.791	0.88	0.16	0.07	1.10	672.7	0.47	285.6	0.88
North: Route 9 SB									
1 LT	0.635	0.81	0.06	0.13	1.00	486.9	0.20	95.9	0.81
2 TR	0.635	0.81	0.06	0.12	0.99	487.6	0.19	96.1	0.81
West: Round Lake Bypass EB									
1 L	0.222	0.62	0.00	0.26	0.88	141.8	0.00	0.0	0.66
2 TR	0.259	0.68	0.00	0.17	0.85	129.0	0.00	0.0	0.68

hig is the average value for all movements in a shared lane
hqm is average queue move-up rate for all vehicles queued and unqueued

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Flow Rates and Demand Analysis

Movement Definitions and Flow Rates (O-D)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

From Approach	To Approach	Mov ID	Turn	Flow Rate LV	Flow Rate HV	Flow Scale Fixed	Flow Scale Var	Peak Flow Factor
South: Route 9 NB								
	East	8R	Right	31	0	1.00	1.00	0.96
	North	8T	Thru	521	5	1.00	1.00	0.96
	West	3L	Left	2	0	1.00	1.00	0.96
East: Route 67 WB								
	South	1L	Left	125	0	1.00	1.00	0.96
	North	6R	Right	136	4	1.00	1.00	0.96
	West	6T	Thru	450	19	1.00	1.00	0.96
North: Route 9 SB								
	South	4T	Thru	396	0	1.00	1.00	0.96
	East	7L	Left	197	6	1.00	1.00	0.96
	West	4R	Right	373	8	1.00	1.00	0.96
West: Round Lake Bypass EB								
	South	2R	Right	16	0	1.00	1.00	0.96
	East	2T	Thru	114	22	1.00	1.00	0.96
	North	5L	Left	160	2	1.00	1.00	0.96

Unit Time for Volumes = 60 minutes
Peak Flow Period = 15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor

Go to Table Links (Top)

Flow Rates (Separate Light and Heavy Vehicles)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

Intersection ID: 1
Roundabout

Mov ID	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV

Demand flows in veh/h as used by the program

```
South: Route 9 NB
   3L L       2      0      0      0      0      0
   8T T       0      0    521      5      0      0
   8R R       0      0      0      0     31      0
-----------------------------------------------
East: Route 67 WB
   1L L     125      0      0      0      0      0
   6T T       0      0    450     19      0      0
   6R R       0      0      0      0    136      4
-----------------------------------------------
North: Route 9 SB
   7L L     197      6      0      0      0      0
   4T T       0      0    396      0      0      0
   4R R       0      0      0      0    373      8
-----------------------------------------------
West: Round Lake Bypass EB
   5L L     160      2      0      0      0      0
   2T T       0      0    114     22      0      0
   2R R       0      0      0      0     16      0
-----------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Flow Rates (Total Vehicles and Percent Heavy)
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

```
Intersection ID: 1
Roundabout

-----------------------------------------------------
  Mov          Left         Through        Right
  ID        ----------    ----------    ----------
            Total  %HV    Total  %HV    Total  %HV
-----------------------------------------------------
Demand flows in veh/h as used by the program
South: Route 9 NB
   3L L       2   0.0       0   0.0       0   0.0
   8T T       0   0.0     526   1.0       0   0.0
   8R R       0   0.0       0   0.0      31   0.0
-----------------------------------------------------
East: Route 67 WB
   1L L     125   0.0       0   0.0       0   0.0
   6T T       0   0.0     469   4.0       0   0.0
   6R R       0   0.0       0   0.0     141   3.0
-----------------------------------------------------
North: Route 9 SB
   7L L     203   3.0       0   0.0       0   0.0
   4T T       0   0.0     396   0.0       0   0.0
   4R R       0   0.0       0   0.0     380   2.0
-----------------------------------------------------
West: Round Lake Bypass EB
   5L L     161   1.0       0   0.0       0   0.0
   2T T       0   0.0     135  16.0       0   0.0
   2R R       0   0.0       0   0.0      16   0.0
-----------------------------------------------------
Unit Time for Volumes =  60 minutes
Peak Flow Period =  15 minutes
Flow Rates include effects of Flow Scale and Peak Flow Factor
```

Go to Table Links (Top)

Other

Model Settings
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

```
Intersection ID: 1
Roundabout

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Model Defaults: Copy of US HCM (US)
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  HCM Delay Model option used
  HCM Queue Model option used
  Level of Service based on: Delay (HCM 2000)
  Queue percentile: 50%
```

Go to Table Links (Top)

Parameters Used in Cost Calculations
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

```
Intersection ID: 1
Roundabout

   Pump price of fuel ($/US gal)              =     2.400
   Fuel resource cost factor                  =      0.70
   Ratio of running cost to fuel cost         =       3.0
   Average income ($/h)                       =     19.00
   Time value factor                          =      0.40
   Light vehicle mass (1000 lb)               =       3.1
   Heavy vehicle mass (1000 lb)               =      24.0
   Light vehicle idle fuel rate (US gal/h)    =     0.360
   Heavy vehicle idle fuel rate (US gal/h)    =     0.530
```

Go to Table Links (Top)

Diagnostics
Site:Route 9/Route 67 Round Lake Bypass - PM Peak - Build 2022 w/Imp - RC

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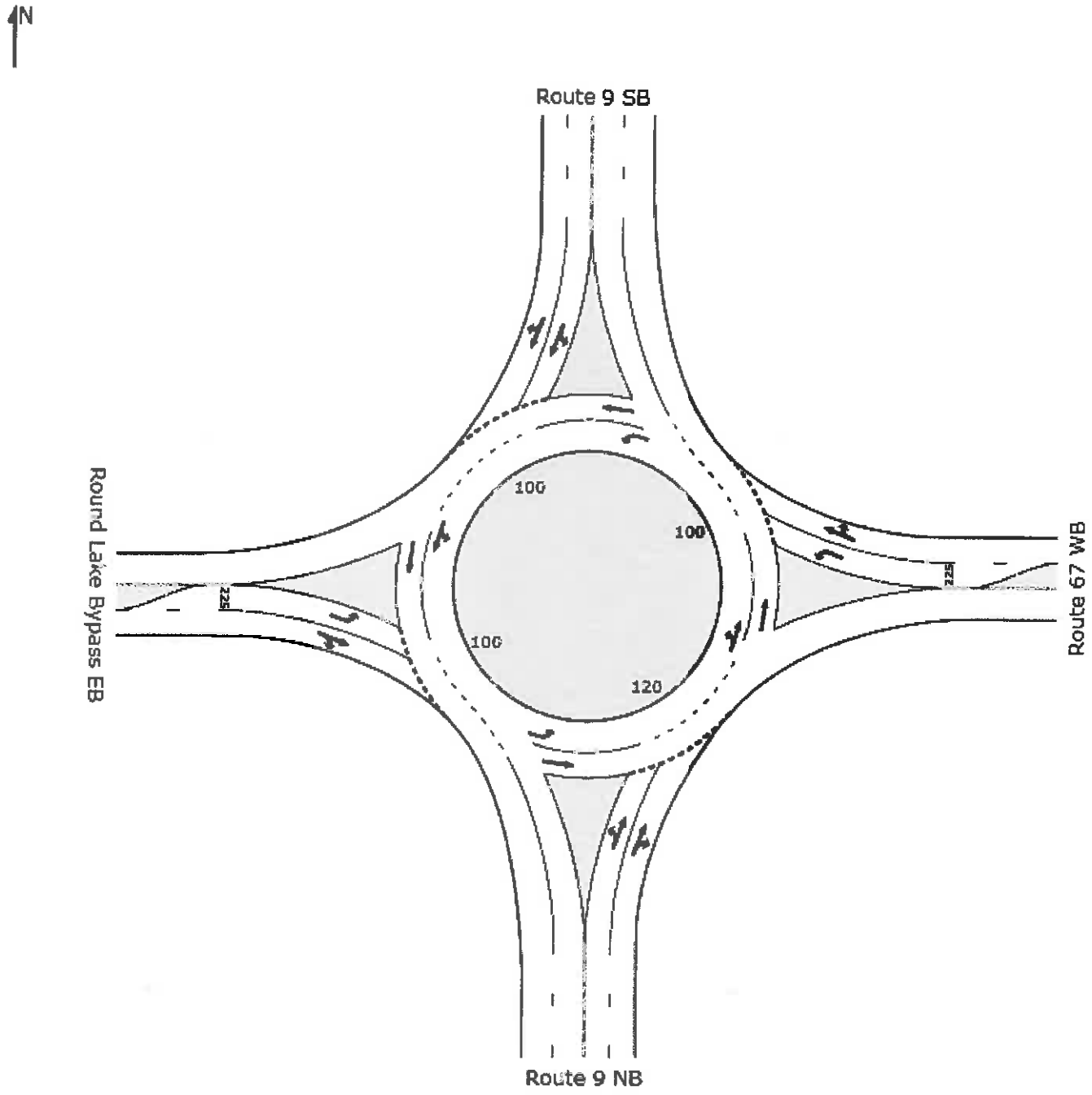
SIDRA INTERSECTION 5.1.12.2089 www.sidrasolutions.com
Project: F:\Projects\2012\112-118 Global Foundries\comps\traffic\Sidra 2012\16-RT9RT67RLBYPASS.sip
8000774, CREIGHTON MANNING ENGINEERING, SINGLE

SIDRA INTERSECTION


N
Route 9 SB
Round Lake Bypass EB
Route 67 WB
Route 9 NB
100
100
100
120
225
225

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: MDN
Agency/Co.: CME, RL11SBnbam
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Round Lake Rd / Exit 11 SB
Jurisdiction: Malta, Saratoga County
Units: U. S. Customary
Analysis Year: 2022 No-Build
Project ID: 112-091, GF Malta TIS
East/West Street: Round Lake Road
North/South Street: Exit 11 SB
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		370	420	165	240	
Peak-Hour Factor, PHF		0.89	0.89	0.89	0.89	
Hourly Flow Rate, HFR		415	471	185	269	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				30		210
Peak Hour Factor, PHF				0.89		0.89
Hourly Flow Rate, HFR				33		235
Percent Heavy Vehicles				25		2
Percent Grade (%)		0			-2	
Flared Approach: Exists?/Storage				/		Yes /3
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L					LR	
v (vph)		185					268	
C(m) (vph)		758					891	
v/c		0.24					0.30	
95% queue length		0.96					1.27	
Control Delay		11.3					14.9	
LOS		B					B	
Approach Delay							14.9	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Creighton Manning Engineering, LLP
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4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
E-Mail: cme@cmellp.com

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MDN
Agency/Co.: CME, RL11SBnbam
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Round Lake Rd / Exit 11 SB
Jurisdiction: Malta, Saratoga County
Units: U. S. Customary
Analysis Year: 2022 No-Build
Project ID: 112-091, GF Malta TIS
East/West Street: Round Lake Road
North/South Street: Exit 11 SB
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		370	420	165	240	
Peak-Hour Factor, PHF		0.89	0.89	0.89	0.89	
Peak-15 Minute Volume		104	118	46	67	
Hourly Flow Rate, HFR		415	471	185	269	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				30		210
Peak Hour Factor, PHF				0.89		0.89
Peak-15 Minute Volume				8		59
Hourly Flow Rate, HFR				33		235
Percent Heavy Vehicles				25		2
Percent Grade (%)		0			-2	
Flared Approach: Exists?/Storage				/		Yes /3
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	1	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1				7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			3				25		2
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	-2.00	-2.00	-2.00
t(3,lt)			0.00				0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.1				6.3		6.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20				3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		3				25		2
t(f)		2.2				3.7		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		887				1289		269
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		269
Potential Capacity		781
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		781
Probability of Queue free St.	1.00	0.70

Step 2: LT from Major St.	4	1
Conflicting Flows	887	
Potential Capacity	759	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	758	
Probability of Queue free St.	0.76	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.76	0.76
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		1289
Potential Capacity		187
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.76	
Maj. L, Min T Adj. Imp Factor.	0.81	
Cap. Adj. factor due to Impeding mvmnt	0.57	0.76
Movement Capacity		141

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.76	0.76
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		1289
Potential Capacity		187
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.76	
Maj. L, Min T Adj. Imp Factor.	0.81	
Cap. Adj. factor due to Impeding mvmnt	0.57	0.76
Movement Capacity		141
Results for Two-stage process:		
a		
y		
C t		141

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				33		235
Movement Capacity (vph)				141		781
Shared Lane Capacity (vph)					501	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				141		781
Volume				33		235
Delay				38.2		11.6
Q sep				0.35		0.76
Q sep +1				1.35		1.76
round (Qsep +1)				1		2
n max					2	
C sh					501	
SUM C sep					891	
n					3	
C act					891	

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L					LR	
v (vph)		185					268	
C(m) (vph)		758					891	
v/c		0.24					0.30	
95% queue length		0.96					1.27	
Control Delay		11.3					14.9	
LOS		B					B	
Approach Delay							14.9	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.76
v(i1), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(i1), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		11.3
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: MDN
Agency/Co.: CME, RL11SBbuam
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Round Lake Rd / Exit 11 SB
Jurisdiction: Malta, Saratoga County
Units: U. S. Customary
Analysis Year: 2022 Build
Project ID: 112-091, GF Malta TIS
East/West Street: Round Lake Road
North/South Street: Exit 11 SB
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		480	420	185	255	
Peak-Hour Factor, PHF		0.89	0.89	0.89	0.89	
Hourly Flow Rate, HFR		539	471	207	286	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				200		210
Peak Hour Factor, PHF				0.89		0.89
Hourly Flow Rate, HFR				224		235
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			-2	
Flared Approach: Exists?/Storage				/		Yes /3
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L					LR	
v (vph)		207					459	
C(m) (vph)		681					205	
v/c		0.30					2.24	
95% queue length		1.28					36.47	
Control Delay		12.6					610.2	
LOS		B					F	
Approach Delay							610.2	
Approach LOS							F	

HCS+: Unsignalized Intersections Release 5.6

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TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MDN
Agency/Co.: CME, RL11SBbuam
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Round Lake Rd / Exit 11 SB
Jurisdiction: Malta, Saratoga County
Units: U. S. Customary
Analysis Year: 2022 Build
Project ID: 112-091, GF Malta TIS
East/West Street: Round Lake Road
North/South Street: Exit 11 SB
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		480	420	185	255	
Peak-Hour Factor, PHF		0.89	0.89	0.89	0.89	
Peak-15 Minute Volume		135	118	52	72	
Hourly Flow Rate, HFR		539	471	207	286	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				200		210
Peak Hour Factor, PHF				0.89		0.89
Peak-15 Minute Volume				56		59
Hourly Flow Rate, HFR				224		235
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			-2	
Flared Approach: Exists?/Storage				/		Yes /3
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	1	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1				7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			3				2		2
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	-2.00	-2.00	-2.00
t(3,lt)			0.00				0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.1				6.0		6.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20				3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		3				2		2
t(f)		2.2				3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		1011				1474		286
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		286
Potential Capacity		765
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		765
Probability of Queue free St.	1.00	0.69

Step 2: LT from Major St.	4	1
Conflicting Flows	1011	
Potential Capacity	682	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	681	
Probability of Queue free St.	0.70	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.70	0.70
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		1474
Potential Capacity		164
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.70	
Maj. L, Min T Adj. Imp Factor.	0.76	
Cap. Adj. factor due to Impeding mvmnt	0.53	0.70
Movement Capacity		114

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.70	0.70
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		1474
Potential Capacity		164
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.70	
Maj. L, Min T Adj. Imp Factor.	0.76	
Cap. Adj. factor due to Impeding mvmnt	0.53	0.70
Movement Capacity		114
Results for Two-stage process:		
a		
y		
C t		114

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				224		235
Movement Capacity (vph)				114		765
Shared Lane Capacity (vph)					202	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				114		765
Volume				224		235
Delay				527.6		11.8
Q sep				32.83		0.77
Q sep +1				33.83		1.77
round (Qsep +1)				34		2
n max					34	
C sh					202	
SUM C sep					234	
n					3	
C act					205	

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L					LR	
v (vph)		207					459	
C(m) (vph)		681					205	
v/c		0.30					2.24	
95% queue length		1.28					36.47	
Control Delay		12.6					610.2	
LOS		B					F	
Approach Delay							610.2	
Approach LOS							F	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.70
v(i1), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(i1), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		12.6
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, RL11NBbuami
Date: 1/25/11
Period: AM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Round Lake Road

Inter.: Round Lake Road / Exit 11 SB
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build with Imp

N/S St: Exit 11 SB

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	1	1	0	0	0	0	0	0	0
LGConfig		T	R	L	T						LR	
Volume		480	420	185	255					200		210
Lane Width		10.0	10.0	10.0	10.0						15.0	
RTOR Vol			0									0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left					NB	Left				
Thru		A				Thru				
Right		A				Right				
Peds						Peds				
WB Left	A	A			SB	Left	A			
Thru	A	A				Thru				
Right						Right	A			
Peds						Peds				
NB Right					EB	Right	A			
SB Right					WB	Right				
Green	9.0	26.0					20.0			
Yellow	3.0	3.0					3.0			
All Red	2.0	2.0					2.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
T	627	1689	0.86	0.37	31.9	C	18.9	B
R	1077	1478	0.44	0.73	4.1	A		
Westbound								
L	349	1636	0.60	0.57	13.4	B		
T	974	1705	0.29	0.57	7.9	A	10.2	B
Northbound								
Southbound								
LR	532	1862	0.87	0.29	37.8	D	37.8	D

Intersection Delay = 21.2 (sec/veh) Intersection LOS = C

HCS+: Signalized Intersections Release 5.5

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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, RL11NBbuami
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Round Lake Road / Exit 11 SB
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build with Imp
Project ID: 110-255, GF Malta TIS
E/W St: Round Lake Road N/S St: Exit 11 SB

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume		480	420	185	255					200		210
% Heavy Veh		5	2	3	4					2		2
PHF		0.89	0.89	0.89	0.89					0.89		0.89
PK 15 Vol		135	118	52	72					56		59
Hi Ln Vol												
% Grade		0			0						0	
Ideal Sat		1900	1900	1900	1900						1900	
ParkExist												
NumPark												
No. Lanes	0	1	1		1	1	0	0	0	0	0	0
LGConfig		T	R	L		T					LR	
Lane Width		10.0	10.0	10.0	10.0						15.0	
RTOR Vol			0									0
Adj Flow		539	472	208	287						461	
%InSharedLn												
Prop LTs		0.000		1.000	0.000						0.488	
Prop RTs	0.000		1.000		0.000					0.512		
Peds Bikes	0						0			0		
Buses		0	0	0	0						0	
%InProtPhase				0.0								

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet		0.0	0.0	0.0	0.0						0.0	
Arriv. Type		3	3	3	3						3	
Unit Ext.		3.0	3.0	3.0	3.0						3.0	
I Factor		1.000			0.941						1.000	
Lost Time		2.0	2.0	2.0	2.0						2.0	
Ext of g		2.0	2.0	2.0	2.0						2.0	
Ped Min g		3.2						3.2			3.2	

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left								
	Thru		A						
	Right		A						
	Peds								
WB	Left	A	A						
	Thru	A	A						
	Right								
	Peds								
NB	Right								
SB	Right								
NB	Left								
	Thru								
	Right								
	Peds								
SB	Left	A							
	Thru								
	Right	A							
	Peds								
EB	Right	A							
WB	Right								
Green		9.0	26.0			20.0			
Yellow		3.0	3.0			3.0			
All Red		2.0	2.0			2.0			

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V		480	420	185	255					200		210
PHF		0.89	0.89	0.89	0.89					0.89		0.89
Adj flow		539	472	208	287					225		236
No. Lanes	0	1	1	1	1	0	0	0	0	0	0	0
Lane group		T	R	L	T						LR	
Adj flow		539	472	208	287						461	
Prop LTs		0.000		1.000	0.000						0.488	
Prop RTs	0.000	1.000		0.000						0.512		

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound		Westbound				Northbound			Southbound		
LG	T	R	L	T						LR		
So	1900	1900	1900	1900						1900		
Lanes 0	1	1	1	1	0	0	0	0	0	0	0	
fW	0.933	0.933	0.933	0.933						1.100		
fHV	0.952	0.980	0.971	0.962						0.980		
fG	1.000	1.000	1.000	1.000						1.000		
fP	1.000	1.000	1.000	1.000						1.000		
fBB	1.000	1.000	1.000	1.000						1.000		
fA	1.000	1.000	1.000	1.000						1.000		
fLU	1.000	1.000	1.000	1.000						1.000		
fRT	1.000	0.850		1.000						0.931		
fLT	1.000		0.950	1.000						0.976		
Sec.			0.182									
fLpb	1.000		1.000	1.000						1.000		
fRpb	1.000	1.000		1.000						1.000		
S	1689	1478	1636	1705						1862		
Sec.			314									

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	T	539	1689	# 0.32	0.37	627	0.86
Right	R	472	1478	0.32	0.73	1077	0.44
Westbound							
Prot		208	1636	# 0.13	0.129	210	0.99
Perm		0	314	0.00	0.443	139	0.00
Left	L	208			0.57	349	0.60
Prot							
Perm							
Thru	T	287	1705	0.17	0.57	974	0.29
Right							
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LR	461	1862	# 0.25	0.29	532	0.87
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.69
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.88

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
T	0.86	0.37	20.3	1.000	627	0.39	11.6	0.0	31.9	C	18.9	B
R	0.44	0.73	3.8	1.000	1077	0.11	0.3	0.0	4.1	A		
Westbound												
L	0.60	0.57	10.8	1.000	349	0.18	2.6	0.0	13.4	B		
T	0.29	0.57	7.7	1.000	974	0.11	0.2	0.0	7.9	A	10.2	B
Northbound												
Southbound												
LR	0.87	0.29	23.7	1.000	532	0.40	14.1	0.0	37.8	D	37.8	D

Intersection delay = 21.2 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 70.0 sec				
Total actual green time for LT lane group, G (s)		40.0		
Effective permitted green time for LT lane group, g(s)		31.0		
Opposing effective green time, go (s)		26.0		
Number of lanes in LT lane group, N		1		
Number of lanes in opposing approach, No		1		
Adjusted LT flow rate, VLT (veh/h)		208		
Proportion of LT in LT lane group, PLT		1.000		
Proportion of LT in opposing flow, PLTo		0.00		
Adjusted opposing flow rate, Vo (veh/h)		539		
Lost time for LT lane group, tL		5.00		
Computation				
LT volume per cycle, LTC=VLTC/3600		4.04		
Opposing lane util. factor, fLUo	1.000	1.000	1.000	
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)		10.48		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g		0.0		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)		1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]		0.63		
gq, (see Exhibit C16-4,5,6,7,8)		18.81		
gu=g-gq if gq>=gf, or = g-gf if gq<gf		12.19		
n=Max(gq-gf)/2,0)		9.40		
PTHo=1-PLTo		1.00		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]		1.00		
EL1 (refer to Exhibit C16-3)		2.16		
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g		0.13		
gdiff=max(gq-gf,0)		0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)		0.18		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT		0.182		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 70.0 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				
Number of lanes in LT lane group, N				

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000 0.488
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	70.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v			208		
v/c ratio from Capacity Worksheet, X			0.60		
Protected phase effective green interval, g (s)			9.0		
Opposing queue effective green interval, gq			18.81		
Unopposed green interval, gu			12.19		
Red time r=(C-g-gq-gu)			30.0		
Arrival rate, qa=v/(3600(max[X,1.0]))			0.06		
Protected ph. departure rate, Sp=s/3600			0.454		
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)			0.22		
XPerm			0.66		
XProt			0.55		
Case			1		
Queue at beginning of green arrow, Qa			1.73		
Queue at beginning of unsaturated green, Qu			1.09		
Residual queue, Qr			0.00		
Uniform Delay, d1			10.8		

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
	0.0						0.0	
T	0.0	0.00	22.0	20.3	0.00	0.0	0.0	31.9
R	0.0	0.00	9.5	3.8	0.00	0.0	0.0	4.1
Westbound								
L	0.0	0.00		10.8	0.00	0.0	0.0	13.4
T	0.0	0.00	15.0	7.7	0.00	0.0	0.0	7.9
	0.0						0.0	
Northbound								
	0.0						0.0	
	0.0						0.0	
	0.0						0.0	
Southbound								
	0.0						0.0	
LR	0.0	0.00	25.0	23.7	0.00	0.0	0.0	37.8
	0.0						0.0	

Intersection Delay 21.2 sec/veh Intersection LOS C

BACK OF QUEUE WORKSHEET

	Eastbound		Westbound		Northbound			Southbound		
LaneGroup	T	R	L	T				LR		
Init Queue	0.0	0.0	0.0	0.0				0.0		
Flow Rate	539	472	208	287				461		
So	1900	1900	1900	1900				1900		
No.Lanes	0 1	1	1	1 0	0	0	0	0	0	0
SL	1689	1478	611	1705				1862		
LnCapacity	627	1077	349	974				532		
Flow Ratio	0.3	0.3	0.3	0.2				0.2		
v/c Ratio	0.86	0.44	0.60	0.29				0.87		
Grn Ratio	0.37	0.73	0.57	0.57				0.29		
I Factor	1.000			0.941				1.000		
AT or PVG	3	3	3	3				3		
Pltn Ratio	1.00	1.00	1.00	1.00				1.00		
PF2	1.00	1.00	1.00	1.00				1.00		
Q1	9.7	3.7	1.9	2.9				8.5		
kB	0.4	0.6	0.3	0.5				0.4		
Q2	2.3	0.5	0.4	0.2				2.1		
Q Average	12.0	4.1	2.3	3.1				10.6		
Q Spacing	24.9	25.0	25.0	24.9				25.0		
Q Storage	0	0	0	0				0		
Q S Ratio										
70th Percentile Output:										
fB%	1.2	1.2	1.2	1.2				1.2		
BOQ	14.0	4.9	2.8	3.7				12.5		
QSRatio										
85th Percentile Output:										
fB%	1.5	1.6	1.6	1.6				1.5		
BOQ	17.9	6.5	3.6	4.9				16.1		
QSRatio										
90th Percentile Output:										
fB%	1.6	1.7	1.8	1.7				1.6		
BOQ	19.4	7.1	4.0	5.4				17.4		
QSRatio										
95th Percentile Output:										
fB%	1.8	2.0	2.0	2.0				1.8		
BOQ	21.6	8.2	4.7	6.2				19.5		
QSRatio										
98th Percentile Output:										
fB%	2.1	2.4	2.5	2.5				2.1		
BOQ	25.1	10.0	5.8	7.7				22.8		
QSRatio										

ERROR MESSAGES

No errors to report.

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TWO-WAY STOP CONTROL SUMMARY

Analyst: MDN
Agency/Co.: CME, RL11SBnbpm
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Round Lake Rd / Exit 11 SB
Jurisdiction: Malta, Saratoga County
Units: U. S. Customary
Analysis Year: 2022 No-Build
Project ID: 112-091, GF Malta TIS
East/West Street: Round Lake Road
North/South Street: Exit 11 SB
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		425	180	210	570	
Peak-Hour Factor, PHF		0.94	0.94	0.94	0.94	
Hourly Flow Rate, HFR		452	191	223	606	
Percent Heavy Vehicles		--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				50		270
Peak Hour Factor, PHF				0.94		0.94
Hourly Flow Rate, HFR				53		287
Percent Heavy Vehicles				11		2
Percent Grade (%)		0			-2	
Flared Approach: Exists?/Storage				/		Yes /3
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L					LR	
v (vph)		223					340	
C(m) (vph)		923					609	
v/c		0.24					0.56	
95% queue length		0.95					3.44	
Control Delay		10.1					28.9	
LOS		B					D	
Approach Delay							28.9	
Approach LOS							D	

HCS+: Unsignalized Intersections Release 5.6

Creighton Manning Engineering, LLP
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E-Mail: cme@cmellp.com

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MDN
Agency/Co.: CME, RL11SBnbpm
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Round Lake Rd / Exit 11 SB
Jurisdiction: Malta, Saratoga County
Units: U. S. Customary
Analysis Year: 2022 No-Build
Project ID: 112-091, GF Malta TIS
East/West Street: Round Lake Road
North/South Street: Exit 11 SB
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		425	180	210	570	
Peak-Hour Factor, PHF		0.94	0.94	0.94	0.94	
Peak-15 Minute Volume		113	48	56	152	
Hourly Flow Rate, HFR		452	191	223	606	
Percent Heavy Vehicles		--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				50		270
Peak Hour Factor, PHF				0.94		0.94
Peak-15 Minute Volume				13		72
Hourly Flow Rate, HFR				53		287
Percent Heavy Vehicles				11		2
Percent Grade (%)		0			-2	
Flared Approach: Exists?/Storage				/		Yes /3
RT Channelized?						
Lanes				0	0	
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

		Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn							
	Through							
S5	Left-Turn							
	Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1				7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			6				11		2
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	-2.00	-2.00	-2.00
t(3,lt)			0.00				0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.2				6.1		6.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20				3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		6				11		2
t(f)		2.3				3.6		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		643				1600		606
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		606
Potential Capacity		514
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		514
Probability of Queue free St.	1.00	0.44

Step 2: LT from Major St.	4	1
Conflicting Flows	643	
Potential Capacity	923	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	923	
Probability of Queue free St.	0.76	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.76	0.76
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		1600
Potential Capacity		133
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.76	
Maj. L, Min T Adj. Imp Factor.	0.81	
Cap. Adj. factor due to Impeding mvmnt	0.36	0.76
Movement Capacity		101

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.76	0.76
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		1600
Potential Capacity		133
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.76	
Maj. L, Min T Adj. Imp Factor.	0.81	
Cap. Adj. factor due to Impeding mvmnt	0.36	0.76
Movement Capacity		101
Results for Two-stage process:		
a		
y		
C t		101

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				53		287
Movement Capacity (vph)				101		514
Shared Lane Capacity (vph)					314	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				101		514
Volume				53		287
Delay				74.6		20.5
Q sep				1.10		1.63
Q sep +1				2.10		2.63
round (Qsep +1)				2		3
n max					3	
C sh					314	
SUM C sep					609	
n					3	
C act					609	

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L					LR	
v (vph)		223					340	
C(m) (vph)		923					609	
v/c		0.24					0.56	
95% queue length		0.95					3.44	
Control Delay		10.1					28.9	
LOS		B					D	
Approach Delay							28.9	
Approach LOS							D	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.76
v(i1), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(i1), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		10.1
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: MDN
Agency/Co.: CME, RL11SBbupm
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Round Lake Rd / Exit 11 SB
Jurisdiction: Malta, Saratoga County
Units: U. S. Customary
Analysis Year: 2022 Build
Project ID: 112-091, GF Malta TIS
East/West Street: Round Lake Road
North/South Street: Exit 11 SB
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		445	180	360	670	
Peak-Hour Factor, PHF		0.94	0.94	0.94	0.94	
Hourly Flow Rate, HFR		473	191	382	712	
Percent Heavy Vehicles		--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				85		270
Peak Hour Factor, PHF				0.94		0.94
Hourly Flow Rate, HFR				90		287
Percent Heavy Vehicles				11		2
Percent Grade (%)		0			-2	
Flared Approach: Exists?/Storage				/		Yes /3
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L					LR	
v (vph)		382					377	
C(m) (vph)		906					142	
v/c		0.42					2.65	
95% queue length		2.12					33.58	
Control Delay		11.8					813.7	
LOS		B					F	
Approach Delay							813.7	
Approach LOS							F	

HCS+: Unsignalized Intersections Release 5.6

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TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: MDN
Agency/Co.: CME, RL11SBbupm
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Round Lake Rd / Exit 11 SB
Jurisdiction: Malta, Saratoga County
Units: U. S. Customary
Analysis Year: 2022 Build
Project ID: 112-091, GF Malta TIS
East/West Street: Round Lake Road
North/South Street: Exit 11 SB
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		445	180	360	670	
Peak-Hour Factor, PHF		0.94	0.94	0.94	0.94	
Peak-15 Minute Volume		118	48	96	178	
Hourly Flow Rate, HFR		473	191	382	712	
Percent Heavy Vehicles		--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				85		270
Peak Hour Factor, PHF				0.94		0.94
Peak-15 Minute Volume				23		72
Hourly Flow Rate, HFR				90		287
Percent Heavy Vehicles				11		2
Percent Grade (%)		0			-2	
Flared Approach: Exists?/Storage				/		Yes /3
RT Channelized?						
Lanes				0	0	
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1				7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			6				11		2
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	-2.00	-2.00	-2.00
t(3,lt)			0.00				0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.2				6.1		6.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20				3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		6				11		2
t(f)		2.3				3.6		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		664				2044		712
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		712
Potential Capacity		450
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		450
Probability of Queue free St.	1.00	0.36

Step 2: LT from Major St.	4	1
Conflicting Flows	664	
Potential Capacity	906	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	906	
Probability of Queue free St.	0.58	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.58	0.58
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		2044
Potential Capacity		73
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.58	
Maj. L, Min T Adj. Imp Factor.	0.67	
Cap. Adj. factor due to Impeding mvmnt	0.24	0.58
Movement Capacity		42

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.58	0.58
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		2044
Potential Capacity		73
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.58	
Maj. L, Min T Adj. Imp Factor.	0.67	
Cap. Adj. factor due to Impeding mvmnt	0.24	0.58
Movement Capacity		42
Results for Two-stage process:		
a		
y		
C t		42

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				90		287
Movement Capacity (vph)				42		450
Shared Lane Capacity (vph)					136	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				42		450
Volume				90		287
Delay				733.6		26.0
Q sep				18.34		2.08
Q sep +1				19.34		3.08
round (Qsep +1)				19		3
n max					19	
C sh					136	
SUM C sep					176	
n					3	
C act					142	

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L					LR	
v (vph)		382					377	
C(m) (vph)		906					142	
v/c		0.42					2.65	
95% queue length		2.12					33.58	
Control Delay		11.8					813.7	
LOS		B					F	
Approach Delay							813.7	
Approach LOS							F	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.58
v(i1), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(i1), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		11.8
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, RL11NBbupmi
Date: 1/25/11
Period: PM PH of AST
Project ID: 110-255, GF Malta TIS
E/W St: Round Lake Road

Inter.: Round Lake Road / Exit 11 SB
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build with Imp

N/S St: Exit 11 SB

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	1	1	0	0	0	0	0	0	0
LGConfig		T	R	L	T						LR	
Volume		445	180	360	670					85		270
Lane Width		10.0	10.0	10.0	10.0						15.0	
RTOR Vol			0									0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left					NB	Left				
Thru		A				Thru				
Right		A				Right				
Peds						Peds				
WB Left	A	A			SB	Left	A			
Thru	A	A				Thru				
Right						Right	A			
Peds						Peds				
NB Right					EB	Right	A			
SB Right					WB	Right				
Green	10.0	27.0					18.0			
Yellow	3.0	3.0					3.0			
All Red	2.0	2.0					2.0			

Cycle Length: 70.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
T	684	1773	0.69	0.39	21.0	C	15.9	B
R	1056	1478	0.18	0.71	3.4	A		
Westbound								
L	423	1589	0.91	0.60	14.6	B		
T	1043	1739	0.68	0.60	9.7	A	11.4	B
Northbound								
Southbound								
LR	457	1779	0.82	0.26	36.3	D	36.3	D

Intersection Delay = 17.2 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.5

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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, RL11NBbupmi
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Round Lake Road / Exit 11 SB
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build with Imp
Project ID: 110-255, GF Malta TIS
E/W St: Round Lake Road N/S St: Exit 11 SB

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume		445	180	360	670					85		270
% Heavy Veh		0	2	6	2					11		2
PHF		0.94	0.94	0.94	0.94					0.94		0.94
PK 15 Vol		118	48	96	178					23		72
Hi Ln Vol												
% Grade		0			0						0	
Ideal Sat		1900	1900	1900	1900						1900	
ParkExist												
NumPark												
No. Lanes	0	1	1	1	1	0	0	0	0	0	0	0
LGConfig		T	R	L	T						LR	
Lane Width		10.0	10.0	10.0	10.0						15.0	
RTOR Vol			0									0
Adj Flow		473	191	383	713						377	
%InSharedLn												
Prop LTs		0.000		1.000	0.000						0.239	
Prop RTs	0.000		1.000		0.000					0.761		
Peds Bikes	0						0			0		
Buses		0	0	0	0						0	
%InProtPhase				0.0								

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Init Unmet		0.0	0.0	0.0	0.0						0.0	
Arriv. Type		3	3	3	3						3	
Unit Ext.		3.0	3.0	3.0	3.0						3.0	
I Factor		1.000			0.128						1.000	
Lost Time		2.0	2.0	2.0	2.0						2.0	
Ext of g		2.0	2.0	2.0	2.0						2.0	
Ped Min g		3.2						3.2			3.2	

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left					NB	Left		
	Thru		A				Thru		
	Right		A				Right		
	Peds						Peds		
WB	Left	A	A			SB	Left	A	
	Thru	A	A				Thru		
	Right						Right	A	
	Peds						Peds		
NB	Right					EB	Right	A	
SB	Right					WB	Right		
Green		10.0	27.0					18.0	
Yellow		3.0	3.0					3.0	
All Red		2.0	2.0					2.0	

Cycle Length: 70.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V		445	180	360	670					85		270
PHF		0.94	0.94	0.94	0.94					0.94		0.94
Adj flow		473	191	383	713					90		287
No. Lanes	0	1	1	1	1	0	0	0	0	0	0	0
Lane group		T	R	L	T						LR	
Adj flow		473	191	383	713						377	
Prop LTs		0.000		1.000	0.000						0.239	
Prop RTs		0.000	1.000		0.000						0.761	

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound		Westbound				Northbound			Southbound		
LG	T	R	L	T						LR		
So	1900	1900	1900	1900						1900		
Lanes	1	1	1	1	0	0	0	0	0	0	0	
fW	0.933	0.933	0.933	0.933						1.100		
fHV	1.000	0.980	0.943	0.980						0.960		
fG	1.000	1.000	1.000	1.000						1.000		
fP	1.000	1.000	1.000	1.000						1.000		
fBB	1.000	1.000	1.000	1.000						1.000		
fA	1.000	1.000	1.000	1.000						1.000		
fLU	1.000	1.000	1.000	1.000						1.000		
fRT	1.000	0.850		1.000						0.897		
fLT	1.000		0.950	1.000						0.988		
Sec.			0.256									
fLpb	1.000		1.000	1.000						1.000		
fRpb	1.000	1.000		1.000						1.000		
S	1773	1478	1589	1739						1779		
Sec.			429									

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	T	473	1773	0.27	0.39	684	0.69
Right	R	191	1478	0.13	0.71	1056	0.18
Westbound							
Prot		227	1589	# 0.14	0.143	227	1.00
Perm		156	429	# 0.36	0.457	196	0.80
Left	L	383			0.60	423	0.91
Prot							
Perm							
Thru	T	713	1739	0.41	0.60	1043	0.68
Right							
Northbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LR	377	1779	# 0.21	0.26	457	0.82
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.72
Total lost time per cycle, L = 10.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.84

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
T	0.69	0.39	18.0	1.000	684	0.26	3.0	0.0	21.0	C	15.9	B
R	0.18	0.71	3.3	1.000	1056	0.11	0.1	0.0	3.4	A		
Westbound												
L	0.91	0.60	10.5	1.000	423	0.43	4.1	0.0	14.6	B		
T	0.68	0.60	9.5	1.000	1043	0.25	0.2	0.0	9.7	A	11.4	B
Northbound												
Southbound												
LR	0.82	0.26	24.5	1.000	457	0.36	11.7	0.0	36.3	D	36.3	D

Intersection delay = 17.2 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	70.0 sec				
Total actual green time for LT lane group, G (s)			42.0		
Effective permitted green time for LT lane group, g(s)			32.0		
Opposing effective green time, go (s)			27.0		
Number of lanes in LT lane group, N			1		
Number of lanes in opposing approach, No			1		
Adjusted LT flow rate, VLT (veh/h)			383		
Proportion of LT in LT lane group, PLT			1.000		
Proportion of LT in opposing flow, PLTo			0.00		
Adjusted opposing flow rate, Vo (veh/h)			473		
Lost time for LT lane group, tL			5.00		
Computation					
LT volume per cycle, LTC=VLTC/3600			7.45		
Opposing lane util. factor, fLUo		1.000	1.000	1.000	
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			9.20		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g			0.0		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)			1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]			0.61		
gq, (see Exhibit C16-4,5,6,7,8)			15.33		
gu=g-gq if gq>=gf, or = g-gf if gq<gf			16.67		
n=Max(gq-gf)/2,0)			7.66		
PTHo=1-PLTo			1.00		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]			1.00		
EL1 (refer to Exhibit C16-3)			2.03		
EL2=Max((1-Ptho**n)/Plto, 1.0)					
fmin=2(1+PL)/g or fmin=2(1+Pl)/g			0.13		
gdiff=max(gq-gf,0)			0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)			0.26		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT			0.256		

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	70.0 sec				
Total actual green time for LT lane group, G (s)					
Effective permitted green time for LT lane group, g(s)					
Opposing effective green time, go (s)					
Number of lanes in LT lane group, N					

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000 0.239
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	70.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v			383		
v/c ratio from Capacity Worksheet, X			0.91		
Protected phase effective green interval, g (s)			10.0		
Opposing queue effective green interval, gq			15.33		
Unopposed green interval, gu			16.67		
Red time r=(C-g-gq-gu)			28.0		
Arrival rate, qa=v/(3600(max[X,1.0]))			0.11		
Protected ph. departure rate, Sp=s/3600			0.441		
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)			0.23		
XPerm			0.89		
XProt			0.92		
Case			1		
Queue at beginning of green arrow, Qa			2.98		
Queue at beginning of unsaturated green, Qu			1.63		
Residual queue, Qr			0.00		
Uniform Delay, d1			10.5		

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
	0.0						0.0	
T	0.0	0.00	21.5	18.0	0.00	0.0	0.0	21.0
R	0.0	0.00	10.0	3.3	0.00	0.0	0.0	3.4
Westbound								
L	0.0	0.00		10.5	0.00	0.0	0.0	14.6
T	0.0	0.00	14.0	9.5	0.00	0.0	0.0	9.7
	0.0						0.0	
Northbound								
	0.0						0.0	
	0.0						0.0	
	0.0						0.0	
Southbound								
	0.0						0.0	
LR	0.0	0.00	26.0	24.5	0.00	0.0	0.0	36.3
	0.0						0.0	

Intersection Delay 17.2 sec/veh Intersection LOS B

BACK OF QUEUE WORKSHEET

	Eastbound		Westbound			Northbound			Southbound		
LaneGroup	T	R	L	T					LR		
Init Queue	0.0	0.0	0.0	0.0					0.0		
Flow Rate	473	191	383	713					377		
So	1900	1900	1900	1900					1900		
No.Lanes	0 1	1	1	1	0	0	0	0	0	0	0
SL	1773	1478	705	1739					1779		
LnCapacity	684	1056	423	1043					457		
Flow Ratio	0.3	0.1	0.5	0.4					0.2		
v/c Ratio	0.69	0.18	0.91	0.68					0.82		
Grn Ratio	0.39	0.71	0.60	0.60					0.26		
I Factor	1.000			0.128					1.000		
AT or PVG	3	3	3	3					3		
Pltn Ratio	1.00	1.00	1.00	1.00					1.00		
PF2	1.00	1.00	1.00	1.00					1.00		
Q1	7.7	1.2	3.4	9.4					6.9		
kB	0.5	0.6	0.0	0.1					0.4		
Q2	1.0	0.1	0.4	0.2					1.5		
Q Average	8.7	1.4	3.8	9.6					8.4		
Q Spacing	24.9	25.0	25.0	24.9					25.0		
Q Storage	0	0	0	0					0		
Q S Ratio											
70th Percentile Output:											
fB%	1.2	1.2	1.2	1.2					1.2		
BOQ	10.3	1.6	4.6	11.3					10.0		
QSRatio											
85th Percentile Output:											
fB%	1.5	1.6	1.6	1.5					1.5		
BOQ	13.3	2.1	6.0	14.5					12.9		
QSRatio											
90th Percentile Output:											
fB%	1.7	1.8	1.7	1.6					1.7		
BOQ	14.5	2.4	6.6	15.8					14.0		
QSRatio											
95th Percentile Output:											
fB%	1.9	2.1	2.0	1.9					1.9		
BOQ	16.3	2.8	7.6	17.7					15.8		
QSRatio											
98th Percentile Output:											
fB%	2.2	2.6	2.4	2.2					2.2		
BOQ	19.3	3.5	9.3	20.9					18.7		
QSRatio											

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, RL11NBnbam
Date: 1/25/11
Period: AM PH of AST
Project ID: 118-091, GF Malta TIS
E/W St: Round Lake Road

Inter.: Round Lake Road / Exit 11 NB
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 No-Build

N/S St: Exit 11 NB

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Volume	210	210			315	35	90		205			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						0			107			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A	A			NB	Left	A			
Thru	A	A				Thru				
Right						Right	A			
Peds						Peds				
WB Left					SB	Left				
Thru		A				Thru				
Right		A				Right				
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right	A			
Green	10.0	20.0					20.0			
Yellow	3.0	3.0					3.0			
All Red	2.0	2.0					2.0			

Cycle Length: 65.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	459	1652	0.51	0.54	10.3	B		
T	893	1658	0.26	0.54	8.2	A	9.3	A
Westbound								
T	524	1704	0.68	0.31	23.1	C	21.1	C
R	915	1321	0.04	0.69	3.2	A		
Northbound								
L	567	1843	0.18	0.31	16.6	B		
							16.9	B
R	460	1494	0.24	0.31	17.1	B		
Southbound								

Intersection Delay = 15.1 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
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OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, RL11NBnbam
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Round Lake Road / Exit 11 NB
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 No-Build
Project ID: 118-091, GF Malta TIS
E/W St: Round Lake Road N/S St: Exit 11 NB

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	210	210			315	35	90		205			
% Heavy Veh	3	8			3	21	5		5			
PHF	0.89	0.89			0.89	0.89	0.89		0.89			
PK 15 Vol	59	59			88	10	25		58			
Hi Ln Vol												
% Grade		-2			2			-1				
Ideal Sat	1900	1900			1900	1900	1900		1900			
ParkExist												
NumPark												
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						0			107			
Adj Flow	236	236			354	39	101		110			
%InSharedLn												
Prop LTs	1.000	0.000			0.000							
Prop RTs		0.000		0.000		1.000			1.000			
Peds Bikes				0			0			0		
Buses	0	0			0	0	0		0			
%InProtPhase	0.0											

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A	A			NB Left	A		
	Thru	A	A			Thru			
	Right					Right	A		
	Peds					Peds			
WB	Left					SB Left			
	Thru		A			Thru			
	Right		A			Right			
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right	A		
Green		10.0	20.0				20.0		
Yellow		3.0	3.0				3.0		
All Red		2.0	2.0				2.0		

Cycle Length: 65.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	210	210			315	35	90		205			
PHF	0.89	0.89			0.89	0.89	0.89		0.89			
Adj flow	236	236			354	39	101		110			
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
Lane group	L	T			T	R	L		R			
Adj flow	236	236			354	39	101		110			
Prop LTs	1.000	0.000			0.000							
Prop RTs	0.000			0.000	1.000				1.000			

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound				Westbound		Northbound				Southbound		
LG	L	T			T	R	L		R				
So	1900	1900			1900	1900	1900		1900				
Lanes	1	1	0	0	1	1	1	0	1	0	0	0	
fW	0.933	0.933			0.933	1.000	1.067		0.967				
fHV	0.971	0.926			0.971	0.826	0.952		0.952				
fG	1.010	1.010			0.990	0.990	1.005		1.005				
fP	1.000	1.000			1.000	1.000	1.000		1.000				
fBB	1.000	1.000			1.000	1.000	1.000		1.000				
fA	1.000	1.000			1.000	1.000	1.000		1.000				
fLU	1.000	1.000			1.000	1.000	1.000		1.000				
fRT		1.000			1.000	0.850			0.850				
fLT	0.950	1.000			1.000		0.950						
Sec.	0.307												
fLpb	1.000	1.000			1.000		1.000						
fRpb		1.000			1.000	1.000			1.000				
S	1652	1658			1704	1321	1843		1494				
Sec.	534												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot		236	1652	# 0.14	0.154	254	0.93
Perm		0	534	0.00	0.385	205	0.00
Left	L	236			0.54	459	0.51
Prot							
Perm							
Thru	T	236	1658	0.14	0.54	893	0.26
Right							
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	T	354	1704	# 0.21	0.31	524	0.68
Right	R	39	1321	0.03	0.69	915	0.04
Northbound							
Prot							
Perm							
Left	L	101	1843	0.05	0.31	567	0.18
Prot							
Perm							
Thru							
Right	R	110	1494	# 0.07	0.31	460	0.24
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.42
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.55

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.51	0.54	9.3	1.000	459	0.12	1.0	0.0	10.3	B		
T	0.26	0.54	8.1	1.000	893	0.11	0.2	0.0	8.2	A	9.3	A
Westbound												
T	0.68	0.31	19.7	1.000	524	0.25	3.5	0.0	23.1	C	21.1	C
R	0.04	0.69	3.2	1.000	915	0.11	0.0	0.0	3.2	A		
Northbound												
L	0.18	0.31	16.5	1.000	567	0.11	0.2	0.0	16.6	B		
											16.9	B
R	0.24	0.31	16.8	1.000	460	0.11	0.3	0.0	17.1	B		
Southbound												

Intersection delay = 15.1 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 65.0 sec				
Total actual green time for LT lane group, G (s)	35.0			
Effective permitted green time for LT lane group, g(s)	25.0			
Opposing effective green time, go (s)	20.0			
Number of lanes in LT lane group, N	1			
Number of lanes in opposing approach, No	1			
Adjusted LT flow rate, VLT (veh/h)	236			
Proportion of LT in LT lane group, PLT	1.000			
Proportion of LT in opposing flow, PLTo	0.00			
Adjusted opposing flow rate, Vo (veh/h)	354			
Lost time for LT lane group, tL	5.00			
Computation				
LT volume per cycle, LTC=VLTC/3600	4.26			
Opposing lane util. factor, fLUo	1.000	1.000		
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	6.39			
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0			
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00			
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.69			
gq, (see Exhibit C16-4,5,6,7,8)	11.02			
gu=g-gq if gq>=gf, or = g-gf if gq<gf	13.98			
n=Max(gq-gf)/2,0)	5.51			
PTHo=1-PLTo	1.00			
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00			
EL1 (refer to Exhibit C16-3)	1.82			
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.16			
gdiff=max(gq-gf,0)	0.00			
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.31			
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.307			

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 65.0 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				
Number of lanes in LT lane group, N				

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	65.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v		236			
v/c ratio from Capacity Worksheet, X		0.51			
Protected phase effective green interval, g (s)		10.0			
Opposing queue effective green interval, gq		11.02			
Unopposed green interval, gu		13.98			
Red time r=(C-g-gq-gu)		30.0			
Arrival rate, qa=v/(3600(max[X,1.0]))		0.07			
Protected ph. departure rate, Sp=s/3600		0.459			
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)		0.27			
XPerm		0.44			
XProt		0.57			
Case		1			
Queue at beginning of green arrow, Qa		1.97			
Queue at beginning of unsaturated green, Qu		0.72			
Residual queue, Qr		0.00			
Uniform Delay, d1		9.3			

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00		9.3	0.00	0.0	0.0	10.3
T	0.0	0.00	15.0	8.1	0.00	0.0	0.0	8.2
	0.0						0.0	
Westbound								
	0.0						0.0	
T	0.0	0.00	22.5	19.7	0.00	0.0	0.0	23.1
R	0.0	0.00	10.0	3.2	0.00	0.0	0.0	3.2
Northbound								
L	0.0	0.00	22.5	16.5	0.00	0.0	0.0	16.6
	0.0						0.0	
R	0.0	0.00	22.5	16.8	0.00	0.0	0.0	17.1
Southbound								
	0.0						0.0	
	0.0						0.0	
	0.0						0.0	

Intersection Delay 15.1 sec/veh Intersection LOS B

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound		Northbound			Southbound		
LaneGroup	L	T		T	R	L		R			
Init Queue	0.0	0.0		0.0	0.0	0.0		0.0			
Flow Rate	236	236		354	39	101		110			
So	1900	1900		1900	1900	1900		1900			
No.Lanes	1	1	0	0 1	1	1	0	1	0	0	0
SL	853	1658		1704	1321	1843		1494			
LnCapacity	459	893		524	915	567		460			
Flow Ratio	0.3	0.1		0.2	0.0	0.1		0.1			
v/c Ratio	0.51	0.26		0.68	0.04	0.18		0.24			
Grn Ratio	0.54	0.54		0.31	0.69	0.31		0.31			
I Factor		1.000		1.000			1.000				
AT or PVG	3	3		3	3	3		3			
Pltn Ratio	1.00	1.00		1.00	1.00	1.00		1.00			
PF2	1.00	1.00		1.00	1.00	1.00		1.00			
Q1	2.1	2.3		5.6	0.2	1.3		1.5			
kB	0.4	0.5		0.4	0.5	0.4		0.4			
Q2	0.4	0.2		0.8	0.0	0.1		0.1			
Q Average	2.5	2.5		6.4	0.2	1.4		1.6			
Q Spacing	24.9	24.9		24.9	24.9	24.9		24.9			
Q Storage	0	0		0	0	0		0			
Q S Ratio											
70th Percentile Output:											
fB%	1.2	1.2		1.2	1.2	1.2		1.2			
BOQ	3.0	3.0		7.5	0.3	1.7		1.9			
QSRatio											
85th Percentile Output:											
fB%	1.6	1.6		1.5	1.6	1.6		1.6			
BOQ	4.0	3.9		9.8	0.4	2.3		2.5			
QSRatio											
90th Percentile Output:											
fB%	1.8	1.8		1.7	1.8	1.8		1.8			
BOQ	4.4	4.4		10.8	0.4	2.5		2.8			
QSRatio											
95th Percentile Output:											
fB%	2.0	2.0		1.9	2.1	2.1		2.0			
BOQ	5.1	5.0		12.2	0.5	2.9		3.3			
QSRatio											
98th Percentile Output:											
fB%	2.5	2.5		2.3	2.7	2.6		2.6			
BOQ	6.3	6.3		14.7	0.7	3.7		4.1			
QSRatio											

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, RL11NBbuam
Date: 1/25/11
Period: AM PH of AST
Project ID: 118-091, GF Malta TIS
E/W St: Round Lake Road

Inter.: Round Lake Road / Exit 11 NB
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build

N/S St: Exit 11 NB

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Volume	210	490			350	55	90		375			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						0			107			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A	A			NB	Left	A			
Thru	A	A				Thru				
Right						Right	A			
Peds						Peds				
WB Left					SB	Left				
Thru		A				Thru				
Right		A				Right				
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right	A			
Green	10.0	20.0					20.0			
Yellow	3.0	3.0					3.0			
All Red	2.0	2.0					2.0			

Cycle Length: 65.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	430	1652	0.55	0.54	11.2	B		
T	893	1658	0.62	0.54	11.7	B	11.5	B
Westbound								
T	524	1704	0.75	0.31	26.2	C	23.1	C
R	915	1321	0.07	0.69	3.3	A		
Northbound								
L	567	1843	0.18	0.31	16.6	B		
							21.3	C
R	460	1494	0.65	0.31	22.8	C		
Southbound								

Intersection Delay = 17.1 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
E-Mail: cme@cmellp.com

OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, RL11NBbuam
Date Performed: 1/25/11
Analysis Time Period: AM PH of AST
Intersection: Round Lake Road / Exit 11 NB
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build
Project ID: 118-091, GF Malta TIS
E/W St: Round Lake Road N/S St: Exit 11 NB

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	210	490			350	55	90		375			
% Heavy Veh	3	8			3	21	5		5			
PHF	0.89	0.89			0.89	0.89	0.89		0.89			
PK 15 Vol	59	138			98	15	25		105			
Hi Ln Vol												
% Grade		-2			2			-1				
Ideal Sat	1900	1900			1900	1900	1900		1900			
ParkExist												
NumPark												
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						0			107			
Adj Flow	236	551			393	62	101		301			
%InSharedLn												
Prop LTs	1.000	0.000			0.000							
Prop RTs		0.000		0.000		1.000			1.000			
Peds Bikes				0			0			0		
Buses	0	0			0	0	0		0			
%InProtPhase	0.0											
Duration	0.25											

Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A	A			NB Left	A		
	Thru	A	A			Thru			
	Right					Right	A		
	Peds					Peds			
WB	Left					SB Left			
	Thru		A			Thru			
	Right		A			Right			
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right	A		
Green		10.0	20.0				20.0		
Yellow		3.0	3.0				3.0		
All Red		2.0	2.0				2.0		

Cycle Length: 65.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	210	490			350	55	90		375			
PHF	0.89	0.89			0.89	0.89	0.89		0.89			
Adj flow	236	551			393	62	101		301			
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
Lane group	L	T			T	R	L		R			
Adj flow	236	551			393	62	101		301			
Prop LTs	1.000	0.000			0.000							
Prop RTs	0.000			0.000	1.000				1.000			

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound				Westbound		Northbound				Southbound		
LG	L	T			T	R	L		R				
So	1900	1900			1900	1900	1900		1900				
Lanes	1	1	0	0	1	1	1	0	1	0	0	0	
fW	0.933	0.933			0.933	1.000	1.067		0.967				
fHV	0.971	0.926			0.971	0.826	0.952		0.952				
fG	1.010	1.010			0.990	0.990	1.005		1.005				
fP	1.000	1.000			1.000	1.000	1.000		1.000				
fBB	1.000	1.000			1.000	1.000	1.000		1.000				
fA	1.000	1.000			1.000	1.000	1.000		1.000				
fLU	1.000	1.000			1.000	1.000	1.000		1.000				
fRT		1.000			1.000	0.850			0.850				
fLT	0.950	1.000			1.000		0.950						
Sec.	0.263												
fLpb	1.000	1.000			1.000		1.000						
fRpb		1.000			1.000	1.000			1.000				
S	1652	1658			1704	1321	1843		1494				
Sec.	458												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot		236	1652	# 0.14	0.154	254	0.93
Perm		0	458	0.00	0.385	176	0.00
Left	L	236			0.54	430	0.55
Prot							
Perm							
Thru	T	551	1658	0.33	0.54	893	0.62
Right							
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	T	393	1704	# 0.23	0.31	524	0.75
Right	R	62	1321	0.05	0.69	915	0.07
Northbound							
Prot							
Perm							
Left	L	101	1843	0.05	0.31	567	0.18
Prot							
Perm							
Thru							
Right	R	301	1494	# 0.20	0.31	460	0.65
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.57
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.75

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.55	0.54	9.7	1.000	430	0.15	1.5	0.0	11.2	B		
T	0.62	0.54	10.4	1.000	893	0.20	1.3	0.0	11.7	B	11.5	B
Westbound												
T	0.75	0.31	20.3	1.000	524	0.31	6.0	0.0	26.2	C	23.1	C
R	0.07	0.69	3.2	1.000	915	0.11	0.0	0.0	3.3	A		
Northbound												
L	0.18	0.31	16.5	1.000	567	0.11	0.2	0.0	16.6	B		
											21.3	C
R	0.65	0.31	19.5	1.000	460	0.23	3.3	0.0	22.8	C		
Southbound												

Intersection delay = 17.1 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 65.0 sec				
Total actual green time for LT lane group, G (s)	35.0			
Effective permitted green time for LT lane group, g(s)	25.0			
Opposing effective green time, go (s)	20.0			
Number of lanes in LT lane group, N	1			
Number of lanes in opposing approach, No	1			
Adjusted LT flow rate, VLT (veh/h)	236			
Proportion of LT in LT lane group, PLT	1.000			
Proportion of LT in opposing flow, PLTo	0.00			
Adjusted opposing flow rate, Vo (veh/h)	393			
Lost time for LT lane group, tL	5.00			
Computation				
LT volume per cycle, LTC=VLTC/3600	4.26			
Opposing lane util. factor, fLUo	1.000	1.000		
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	7.10			
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0			
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00			
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.69			
gq, (see Exhibit C16-4,5,6,7,8)	12.57			
gu=g-gq if gq>=gf, or = g-gf if gq<gf	12.43			
n=Max(gq-gf)/2,0)	6.28			
PTHo=1-PLTo	1.00			
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00			
EL1 (refer to Exhibit C16-3)	1.89			
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.16			
gdiff=max(gq-gf,0)	0.00			
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.26			
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.263			

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 65.0 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				
Number of lanes in LT lane group, N				

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	65.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v		236			
v/c ratio from Capacity Worksheet, X		0.55			
Protected phase effective green interval, g (s)		10.0			
Opposing queue effective green interval, gq		12.57			
Unopposed green interval, gu		12.43			
Red time r=(C-g-gq-gu)		30.0			
Arrival rate, qa=v/(3600(max[X,1.0]))		0.07			
Protected ph. departure rate, Sp=s/3600		0.459			
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)		0.26			
XPerm		0.52			
XProt		0.57			
Case		1			
Queue at beginning of green arrow, Qa		1.97			
Queue at beginning of unsaturated green, Qu		0.82			
Residual queue, Qr		0.00			
Uniform Delay, d1		9.7			

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00		9.7	0.00	0.0	0.0	11.2
T	0.0	0.00	15.0	10.4	0.00	0.0	0.0	11.7
	0.0						0.0	
Westbound								
	0.0						0.0	
T	0.0	0.00	22.5	20.3	0.00	0.0	0.0	26.2
R	0.0	0.00	10.0	3.2	0.00	0.0	0.0	3.3
Northbound								
L	0.0	0.00	22.5	16.5	0.00	0.0	0.0	16.6
	0.0						0.0	
R	0.0	0.00	22.5	19.5	0.00	0.0	0.0	22.8
Southbound								
	0.0						0.0	
	0.0						0.0	
	0.0						0.0	

Intersection Delay 17.1 sec/veh Intersection LOS B

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound		Northbound			Southbound		
LaneGroup	L	T		T	R	L		R			
Init Queue	0.0	0.0		0.0	0.0	0.0		0.0			
Flow Rate	236	551		393	62	101		301			
So	1900	1900		1900	1900	1900		1900			
No.Lanes	1	1	0	0 1	1	1	0	1	0	0	0
SL	799	1658		1704	1321	1843		1494			
LnCapacity	430	893		524	915	567		460			
Flow Ratio	0.3	0.3		0.2	0.0	0.1		0.2			
v/c Ratio	0.55	0.62		0.75	0.07	0.18		0.65			
Grn Ratio	0.54	0.54		0.31	0.69	0.31		0.31			
I Factor		1.000		1.000			1.000				
AT or PVG	3	3		3	3	3		3			
Pltn Ratio	1.00	1.00		1.00	1.00	1.00		1.00			
PF2	1.00	1.00		1.00	1.00	1.00		1.00			
Q1	2.1	6.9		6.4	0.4	1.3		4.7			
kB	0.3	0.5		0.4	0.5	0.4		0.4			
Q2	0.4	0.8		1.1	0.0	0.1		0.7			
Q Average	2.6	7.7		7.5	0.4	1.4		5.4			
Q Spacing	24.9	24.9		24.9	24.9	24.9		24.9			
Q Storage	0	0		0	0	0		0			
Q S Ratio											
70th Percentile Output:											
fB%	1.2	1.2		1.2	1.2	1.2		1.2			
BOQ	3.1	9.1		8.8	0.5	1.7		6.4			
QSRatio											
85th Percentile Output:											
fB%	1.6	1.5		1.5	1.6	1.6		1.6			
BOQ	4.0	11.8		11.5	0.6	2.3		8.3			
QSRatio											
90th Percentile Output:											
fB%	1.8	1.7		1.7	1.8	1.8		1.7			
BOQ	4.5	12.9		12.5	0.7	2.5		9.1			
QSRatio											
95th Percentile Output:											
fB%	2.0	1.9		1.9	2.1	2.1		1.9			
BOQ	5.2	14.6		14.2	0.8	2.9		10.4			
QSRatio											
98th Percentile Output:											
fB%	2.5	2.3		2.3	2.7	2.6		2.4			
BOQ	6.4	17.4		16.9	1.1	3.7		12.7			
QSRatio											

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, RL11NBbuami
Date: 1/25/11
Period: AM PH of AST
Project ID: 118-091, GF Malta TIS
E/W St: Round Lake Road

Inter.: Round Lake Road / Exit 11 NB
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build with Imp

N/S St: Exit 11 NB

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Volume	210	490			350	55	90		375			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						0			107			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A	A			NB	Left	A			
Thru	A	A				Thru				
Right						Right	A			
Peds						Peds				
WB Left					SB	Left				
Thru		A				Thru				
Right		A				Right				
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right	A			
Green	10.0	40.0					20.0			
Yellow	3.0	3.0					3.0			
All Red	2.0	2.0					2.0			

Cycle Length: 85.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	546	1652	0.43	0.65	8.0	A		
T	1073	1658	0.51	0.65	8.4	A	8.2	A
Westbound								
T	802	1704	0.49	0.47	16.0	B	14.1	B
R	1010	1321	0.06	0.76	2.5	A		
Northbound								
L	434	1843	0.23	0.24	26.6	C		
							43.6	D
R	352	1494	0.86	0.24	49.4	D		
Southbound								

Intersection Delay = 18.5 (sec/veh) Intersection LOS = B

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
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OPERATIONAL ANALYSIS

Analyst:	MDN
Agency/Co.:	CME, RL11NBbuami
Date Performed:	1/25/11
Analysis Time Period:	AM PH of AST
Intersection:	Round Lake Road / Exit 11 NB
Area Type:	All other areas
Jurisdiction:	Malta, Saratoga County
Analysis Year:	2022 Build with Imp

Project ID: 118-091, GF Malta TIS
E/W St: Round Lake Road N/S St: Exit 11 NB

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	210	490			350	55	90		375			
% Heavy Veh	3	8			3	21	5		5			
PHF	0.89	0.89			0.89	0.89	0.89		0.89			
PK 15 Vol	59	138			98	15	25		105			
Hi Ln Vol												
% Grade		-2			2			-1				
Ideal Sat	1900	1900			1900	1900	1900		1900			
ParkExist												
NumPark												
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						0			107			
Adj Flow	236	551			393	62	101		301			
%InSharedLn												
Prop LTs	1.000	0.000			0.000							
Prop RTs		0.000		0.000		1.000			1.000			
Peds Bikes				0			0			0		
Buses	0	0			0	0	0		0			
%InProtPhase	0.0											

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A	A			NB Left	A		
	Thru	A	A			Thru			
	Right					Right	A		
	Peds					Peds			
WB	Left					SB Left			
	Thru		A			Thru			
	Right		A			Right			
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right	A		
Green		10.0	40.0				20.0		
Yellow		3.0	3.0				3.0		
All Red		2.0	2.0				2.0		

Cycle Length: 85.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	210	490			350	55	90		375			
PHF	0.89	0.89			0.89	0.89	0.89		0.89			
Adj flow	236	551			393	62	101		301			
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
Lane group	L	T			T	R	L		R			
Adj flow	236	551			393	62	101		301			
Prop LTs	1.000	0.000			0.000							
Prop RTs	0.000			0.000	1.000				1.000			

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound				Westbound		Northbound				Southbound		
LG	L	T			T	R	L		R				
So	1900	1900			1900	1900	1900		1900				
Lanes	1	1	0	0	1	1	1	0	1	0	0	0	
fW	0.933	0.933			0.933	1.000	1.067		0.967				
fHV	0.971	0.926			0.971	0.826	0.952		0.952				
fG	1.010	1.010			0.990	0.990	1.005		1.005				
fP	1.000	1.000			1.000	1.000	1.000		1.000				
fBB	1.000	1.000			1.000	1.000	1.000		1.000				
fA	1.000	1.000			1.000	1.000	1.000		1.000				
fLU	1.000	1.000			1.000	1.000	1.000		1.000				
fRT		1.000			1.000	0.850			0.850				
fLT	0.950	1.000			1.000		0.950						
Sec.	0.382												
fLpb	1.000	1.000			1.000		1.000						
fRpb		1.000			1.000	1.000			1.000				
S	1652	1658			1704	1321	1843		1494				
Sec.	664												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot		194	1652	# 0.12	0.118	194	1.00
Perm		42	664	0.06	0.529	352	0.12
Left	L	236			0.65	546	0.43
Prot							
Perm							
Thru	T	551	1658	0.33	0.65	1073	0.51
Right							
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	T	393	1704	# 0.23	0.47	802	0.49
Right	R	62	1321	0.05	0.76	1010	0.06
Northbound							
Prot							
Perm							
Left	L	101	1843	0.05	0.24	434	0.23
Prot							
Perm							
Thru							
Right	R	301	1494	# 0.20	0.24	352	0.86
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.55
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.67

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.43	0.65	7.4	1.000	546	0.11	0.6	0.0	8.0	A		
T	0.51	0.65	7.9	1.000	1073	0.12	0.4	0.0	8.4	A	8.2	A
Westbound												
T	0.49	0.47	15.5	1.000	802	0.11	0.5	0.0	16.0	B	14.1	B
R	0.06	0.76	2.5	1.000	1010	0.11	0.0	0.0	2.5	A		
Northbound												
L	0.23	0.24	26.3	1.000	434	0.11	0.3	0.0	26.6	C		
											43.6	D
R	0.86	0.24	31.1	1.000	352	0.39	18.3	0.0	49.4	D		
Southbound												

Intersection delay = 18.5 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 85.0 sec				
Total actual green time for LT lane group, G (s)	55.0			
Effective permitted green time for LT lane group, g(s)	45.0			
Opposing effective green time, go (s)	40.0			
Number of lanes in LT lane group, N	1			
Number of lanes in opposing approach, No	1			
Adjusted LT flow rate, VLT (veh/h)	236			
Proportion of LT in LT lane group, PLT	1.000			
Proportion of LT in opposing flow, PLTo	0.00			
Adjusted opposing flow rate, Vo (veh/h)	393			
Lost time for LT lane group, tL	5.00			
Computation				
LT volume per cycle, LTC=VLTC/3600	5.57			
Opposing lane util. factor, fLUo	1.000	1.000		
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	9.28			
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0			
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00			
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.53			
gq, (see Exhibit C16-4,5,6,7,8)	12.57			
gu=g-gq if gq>=gf, or = g-gf if gq<gf	32.43			
n=Max(gq-gf)/2,0)	6.28			
PTHo=1-PLTo	1.00			
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00			
EL1 (refer to Exhibit C16-3)	1.89			
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.09			
gdiff=max(gq-gf,0)	0.00			
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.38			
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.382			

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 85.0 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				
Number of lanes in LT lane group, N				

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)], (fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	85.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v		236			
v/c ratio from Capacity Worksheet, X		0.43			
Protected phase effective green interval, g (s)		10.0			
Opposing queue effective green interval, gq		12.57			
Unopposed green interval, gu		32.43			
Red time r=(C-g-gq-gu)		30.0			
Arrival rate, qa=v/(3600(max[X,1.0]))		0.07			
Protected ph. departure rate, Sp=s/3600		0.459			
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)		0.26			
XPerm		0.36			
XProt		0.57			
Case		1			
Queue at beginning of green arrow, Qa		1.97			
Queue at beginning of unsaturated green, Qu		0.82			
Residual queue, Qr		0.00			
Uniform Delay, d1		7.4			

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00		7.4	0.00	0.0	0.0	8.0
T	0.0	0.00	15.0	7.9	0.00	0.0	0.0	8.4
	0.0						0.0	
Westbound								
	0.0						0.0	
T	0.0	0.00	22.5	15.5	0.00	0.0	0.0	16.0
R	0.0	0.00	10.0	2.5	0.00	0.0	0.0	2.5
Northbound								
L	0.0	0.00	32.5	26.3	0.00	0.0	0.0	26.6
	0.0						0.0	
R	0.0	0.00	32.5	31.1	0.00	0.0	0.0	49.4
Southbound								
	0.0						0.0	
	0.0						0.0	
	0.0						0.0	

Intersection Delay 18.5 sec/veh Intersection LOS B

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	T			T	R	L		R			
Init Queue	0.0	0.0			0.0	0.0	0.0		0.0			
Flow Rate	236	551			393	62	101		301			
So	1900	1900			1900	1900	1900		1900			
No.Lanes	1	1	0	0	1	1	1	0	1	0	0	0
SL	844	1658			1704	1321	1843		1494			
LnCapacity	546	1073			802	1010	434		352			
Flow Ratio	0.3	0.3			0.2	0.0	0.1		0.2			
v/c Ratio	0.43	0.51			0.49	0.06	0.23		0.86			
Grn Ratio	0.65	0.65			0.47	0.76	0.24		0.24			
I Factor		1.000			1.000			1.000				
AT or PVG	3	3			3	3	3		3			
Pltn Ratio	1.00	1.00			1.00	1.00	1.00		1.00			
PF2	1.00	1.00			1.00	1.00	1.00		1.00			
Q1	2.1	6.9			6.4	0.4	1.9		6.8			
kB	0.5	0.7			0.6	0.7	0.4		0.4			
Q2	0.3	0.7			0.6	0.0	0.1		1.7			
Q Average	2.4	7.6			6.9	0.4	2.1		8.5			
Q Spacing	24.9	24.9			24.9	24.9	24.9		24.9			
Q Storage	0	0			0	0	0		0			
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2			1.2	1.2	1.2		1.2			
BOQ	2.9	9.0			8.2	0.5	2.5		10.0			
QSRatio												
85th Percentile Output:												
fB%	1.6	1.5			1.5	1.6	1.6		1.5			
BOQ	3.8	11.7			10.7	0.6	3.2		12.9			
QSRatio												
90th Percentile Output:												
fB%	1.8	1.7			1.7	1.8	1.8		1.7			
BOQ	4.2	12.7			11.7	0.7	3.6		14.1			
QSRatio												
95th Percentile Output:												
fB%	2.0	1.9			1.9	2.1	2.0		1.9			
BOQ	4.9	14.4			13.2	0.8	4.2		15.9			
QSRatio												
98th Percentile Output:												
fB%	2.5	2.3			2.3	2.7	2.6		2.2			
BOQ	6.1	17.2			15.9	1.1	5.2		18.8			
QSRatio												

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, RL11NBnbpm
Date: 1/25/11
Period: PM PH of AST
Project ID: 112-091, GF Malta TIS
E/W St: Round Lake Road

Inter.: Round Lake Road / Exit 11 NB
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 No-Build

N/S St: Exit 11 NB

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Volume	215	260			485	40	295		125			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						9			44			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A	A			NB	Left	A			
	Thru	A	A				Thru				
	Right						Right	A			
	Peds						Peds				
WB	Left					SB	Left				
	Thru		A				Thru				
	Right		A				Right				
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right	A			
Green		10.0	20.0					20.0			
Yellow		3.0	3.0					3.0			
All Red		2.0	2.0					2.0			

Cycle Length: 65.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	373	1702	0.62	0.54	14.4	B		
T	946	1756	0.30	0.54	8.4	A	11.1	B
Westbound								
T	519	1688	1.01	0.31	63.4	E	59.9	E
R	1107	1599	0.03	0.69	3.2	A		
Northbound								
L	590	1916	0.54	0.31	19.6	B		
							19.0	B
R	473	1538	0.18	0.31	16.7	B		
Southbound								

Intersection Delay = 31.7 (sec/veh) Intersection LOS = C

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
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OPERATIONAL ANALYSIS

Analyst:	MDN
Agency/Co.:	CME, RL11NBnbpm
Date Performed:	1/25/11
Analysis Time Period:	PM PH of AST
Intersection:	Round Lake Road / Exit 11 NB
Area Type:	All other areas
Jurisdiction:	Malta, Saratoga County
Analysis Year:	2022 No-Build

Project ID: 112-091, GF Malta TIS
E/W St: Round Lake Road N/S St: Exit 11 NB

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	215	260			485	40	295		125			
% Heavy Veh	0	2			4	0	1		2			
PHF	0.93	0.93			0.93	0.93	0.93		0.93			
PK 15 Vol	58	70			130	11	79		34			
Hi Ln Vol												
% Grade		-2			2			-1				
Ideal Sat	1900	1900			1900	1900	1900		1900			
ParkExist												
NumPark												
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						9			44			
Adj Flow	231	280			522	33	317		87			
%InSharedLn												
Prop LTs	1.000	0.000			0.000							
Prop RTs	0.000			0.000		1.000			1.000			
Peds Bikes				0			0			6		
Buses	0	0			0	0	0		0			
%InProtPhase	0.0											

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A	A			NB Left	A		
	Thru	A	A			Thru			
	Right					Right	A		
	Peds					Peds			
WB	Left					SB Left			
	Thru		A			Thru			
	Right		A			Right			
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right	A		
Green		10.0	20.0				20.0		
Yellow		3.0	3.0				3.0		
All Red		2.0	2.0				2.0		

Cycle Length: 65.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	215	260			485	40	295		125			
PHF	0.93	0.93			0.93	0.93	0.93		0.93			
Adj flow	231	280			522	33	317		87			
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
Lane group	L	T			T	R	L		R			
Adj flow	231	280			522	33	317		87			
Prop LTs	1.000	0.000			0.000							
Prop RTs	0.000			0.000	1.000			1.000				

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound				Westbound		Northbound				Southbound		
LG	L	T			T	R	L		R				
So	1900	1900			1900	1900	1900		1900				
Lanes	1	1	0	0	1	1	1	0	1	0	0	0	
fW	0.933	0.933			0.933	1.000	1.067		0.967				
fHV	1.000	0.980			0.962	1.000	0.990		0.980				
fG	1.010	1.010			0.990	0.990	1.005		1.005				
fP	1.000	1.000			1.000	1.000	1.000		1.000				
fBB	1.000	1.000			1.000	1.000	1.000		1.000				
fA	1.000	1.000			1.000	1.000	1.000		1.000				
fLU	1.000	1.000			1.000	1.000	1.000		1.000				
fRT		1.000			1.000	0.850			0.850				
fLT	0.950	1.000			1.000		0.950						
Sec.	0.160												
fLpb	1.000	1.000			1.000		1.000						
fRpb		1.000			1.000	1.000			1.000				
S	1702	1756			1688	1599	1916		1538				
Sec.	287												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot		231	1702	# 0.14	0.154	262	0.88
Perm		0	287	0.00	0.385	111	0.00
Left	L	231			0.54	373	0.62
Prot							
Perm							
Thru	T	280	1756	0.16	0.54	946	0.30
Right							
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	T	522	1688	# 0.31	0.31	519	1.01
Right	R	33	1599	0.02	0.69	1107	0.03
Northbound							
Prot							
Perm							
Left	L	317	1916	# 0.17	0.31	590	0.54
Prot							
Perm							
Thru							
Right	R	87	1538	0.06	0.31	473	0.18
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.61
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.79

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.62	0.54	11.3	1.000	373	0.20	3.1	0.0	14.4	B		
T	0.30	0.54	8.2	1.000	946	0.11	0.2	0.0	8.4	A	11.1	B
Westbound												
T	1.01	0.31	22.5	1.000	519	0.50	40.9	0.0	63.4	E	59.9	E
R	0.03	0.69	3.1	1.000	1107	0.11	0.0	0.0	3.2	A		
Northbound												
L	0.54	0.31	18.7	1.000	590	0.14	1.0	0.0	19.6	B		
											19.0	B
R	0.18	0.31	16.5	1.000	473	0.11	0.2	0.0	16.7	B		
Southbound												

Intersection delay = 31.7 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 65.0 sec				
Total actual green time for LT lane group, G (s)	35.0			
Effective permitted green time for LT lane group, g(s)	25.0			
Opposing effective green time, go (s)	20.0			
Number of lanes in LT lane group, N	1			
Number of lanes in opposing approach, No	1			
Adjusted LT flow rate, VLT (veh/h)	231			
Proportion of LT in LT lane group, PLT	1.000			
Proportion of LT in opposing flow, PLTo	0.00			
Adjusted opposing flow rate, Vo (veh/h)	522			
Lost time for LT lane group, tL	5.00			
Computation				
LT volume per cycle, LTC=VLTC/3600	4.17			
Opposing lane util. factor, fLUo	1.000	1.000		
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	9.43			
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0			
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00			
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.69			
gq, (see Exhibit C16-4,5,6,7,8)	18.38			
gu=g-gq if gq>=gf, or = g-gf if gq<gf	6.62			
n=Max(gq-gf)/2,0)	9.19			
PTHo=1-PLTo	1.00			
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00			
EL1 (refer to Exhibit C16-3)	2.13			
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.16			
gdiff=max(gq-gf,0)	0.00			
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.16			
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.160			

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 65.0 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				
Number of lanes in LT lane group, N				

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)], (fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	65.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v		231			
v/c ratio from Capacity Worksheet, X		0.62			
Protected phase effective green interval, g (s)		10.0			
Opposing queue effective green interval, gq		18.38			
Unopposed green interval, gu		6.62			
Red time r=(C-g-gq-gu)		30.0			
Arrival rate, qa=v/(3600(max[X,1.0]))		0.06			
Protected ph. departure rate, Sp=s/3600		0.473			
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)		0.30			
XPerm		0.80			
XProt		0.54			
Case		1			
Queue at beginning of green arrow, Qa		1.92			
Queue at beginning of unsaturated green, Qu		1.18			
Residual queue, Qr		0.00			
Uniform Delay, d1		11.3			

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00		11.3	0.00	0.0	0.0	14.4
T	0.0	0.00	15.0	8.2	0.00	0.0	0.0	8.4
	0.0						0.0	
Westbound								
	0.0						0.0	
T	0.0	0.00	22.5	22.5	0.00	0.7	0.0	63.4
R	0.0	0.00	10.0	3.1	0.00	0.0	0.0	3.2
Northbound								
L	0.0	0.00	22.5	18.7	0.00	0.0	0.0	19.6
	0.0						0.0	
R	0.0	0.00	22.5	16.5	0.00	0.0	0.0	16.7
Southbound								
	0.0						0.0	
	0.0						0.0	
	0.0						0.0	

Intersection Delay 31.7 sec/veh Intersection LOS C

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound		Northbound			Southbound		
LaneGroup	L	T		T	R	L		R			
Init Queue	0.0	0.0		0.0	0.0	0.0		0.0			
Flow Rate	231	280		522	33	317		87			
So	1900	1900		1900	1900	1900		1900			
No.Lanes	1	1	0	0 1	1	1	0	1	0	0	0
SL	691	1756		1688	1599	1916		1538			
LnCapacity	373	946		519	1107	590		473			
Flow Ratio	0.3	0.2		0.3	0.0	0.2		0.1			
v/c Ratio	0.62	0.30		1.01	0.03	0.54		0.18			
Grn Ratio	0.54	0.54		0.31	0.69	0.31		0.31			
I Factor		1.000		1.000			1.000				
AT or PVG	3	3		3	3	3		3			
Pltn Ratio	1.00	1.00		1.00	1.00	1.00		1.00			
PF2	1.00	1.00		1.00	1.00	1.00		1.00			
Q1	2.1	2.8		9.4	0.2	4.7		1.2			
kB	0.3	0.5		0.4	0.6	0.4		0.4			
Q2	0.5	0.2		5.2	0.0	0.5		0.1			
Q Average	2.6	3.0		14.6	0.2	5.2		1.2			
Q Spacing	24.9	24.9		24.9	25.0	24.9		24.9			
Q Storage	0	0		0	0	0		0			
Q S Ratio											
70th Percentile Output:											
fB%	1.2	1.2		1.2	1.2	1.2		1.2			
BOQ	3.1	3.6		17.1	0.2	6.2		1.5			
QSRatio											
85th Percentile Output:											
fB%	1.6	1.6		1.5	1.6	1.6		1.6			
BOQ	4.1	4.7		21.7	0.3	8.1		2.0			
QSRatio											
90th Percentile Output:											
fB%	1.8	1.7		1.6	1.8	1.7		1.8			
BOQ	4.6	5.2		23.3	0.4	8.9		2.2			
QSRatio											
95th Percentile Output:											
fB%	2.0	2.0		1.8	2.1	1.9		2.1			
BOQ	5.3	6.0		25.8	0.4	10.2		2.5			
QSRatio											
98th Percentile Output:											
fB%	2.5	2.5		2.0	2.7	2.4		2.6			
BOQ	6.6	7.5		29.6	0.6	12.4		3.2			
QSRatio											

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, RL11NBbupm
Date: 1/25/11
Period: PM PH of AST
Project ID: 112-091, GF Malta TIS
E/W St: Round Lake Road

Inter.: Round Lake Road / Exit 11 NB
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Build

N/S St: Exit 11 NB

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Volume	215	315			735	190	295		160			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						9			44			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A	A			NB	Left	A			
	Thru	A	A				Thru				
	Right						Right	A			
	Peds						Peds				
WB	Left					SB	Left				
	Thru		A				Thru				
	Right		A				Right				
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right	A			
Green		10.0	20.0					20.0			
Yellow		3.0	3.0					3.0			
All Red		2.0	2.0					2.0			

Cycle Length: 65.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	373	1702	0.62	0.54	15.0	B		
T	946	1756	0.36	0.54	8.8	A	11.3	B
Westbound								
T	519	1688	1.52	0.31	267.2	F	215.0	F
R	1107	1599	0.18	0.69	3.6	A		
Northbound								
L	590	1916	0.54	0.31	19.6	B		
							19.0	B
R	473	1538	0.26	0.31	17.3	B		
Southbound								

Intersection Delay = 113.5 (sec/veh) Intersection LOS = F

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
E-Mail: cme@cmellp.com

OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, RL11NBbupm
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Round Lake Road / Exit 11 NB
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Build
Project ID: 112-091, GF Malta TIS
E/W St: Round Lake Road N/S St: Exit 11 NB

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	215	315			735	190	295		160			
% Heavy Veh	0	2			4	0	1		2			
PHF	0.93	0.93			0.93	0.93	0.93		0.93			
PK 15 Vol	58	85			198	51	79		43			
Hi Ln Vol												
% Grade		-2			2			-1				
Ideal Sat	1900	1900			1900	1900	1900		1900			
ParkExist												
NumPark												
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						9			44			
Adj Flow	231	339			790	195	317		125			
%InSharedLn												
Prop LTs	1.000	0.000			0.000							
Prop RTs	0.000			0.000		1.000			1.000			
Peds Bikes				0			0			6		
Buses	0	0			0	0	0		0			
%InProtPhase	0.0											
Duration	0.25											

Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A	A			NB	Left	A			
	Thru	A	A				Thru				
	Right						Right	A			
	Peds						Peds				
WB	Left					SB	Left				
	Thru		A				Thru				
	Right		A				Right				
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right	A			
Green		10.0	20.0					20.0			
Yellow		3.0	3.0					3.0			
All Red		2.0	2.0					2.0			

Cycle Length: 65.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	215	315			735	190	295		160			
PHF	0.93	0.93			0.93	0.93	0.93		0.93			
Adj flow	231	339			790	195	317		125			
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
Lane group	L	T			T	R	L		R			
Adj flow	231	339			790	195	317		125			
Prop LTs	1.000	0.000			0.000							
Prop RTs	0.000			0.000	1.000				1.000			

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound				Westbound		Northbound			Southbound		
LG	L	T			T	R	L		R			
So	1900	1900			1900	1900	1900		1900			
Lanes	1	1	0	0	1	1	1	0	1	0	0	0
fW	0.933	0.933			0.933	1.000	1.067		0.967			
fHV	1.000	0.980			0.962	1.000	0.990		0.980			
fG	1.010	1.010			0.990	0.990	1.005		1.005			
fP	1.000	1.000			1.000	1.000	1.000		1.000			
fBB	1.000	1.000			1.000	1.000	1.000		1.000			
fA	1.000	1.000			1.000	1.000	1.000		1.000			
fLU	1.000	1.000			1.000	1.000	1.000		1.000			
fRT		1.000			1.000	0.850			0.850			
fLT	0.950	1.000			1.000		0.950					
Sec.	0.160											
fLpb	1.000	1.000			1.000		1.000					
fRpb		1.000			1.000	1.000			1.000			
S	1702	1756			1688	1599	1916		1538			
Sec.	287											

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot		231	1702	# 0.14	0.154	262	0.88
Perm		0	287	0.00	0.385	111	0.00
Left	L	231			0.54	373	0.62
Prot							
Perm							
Thru	T	339	1756	0.19	0.54	946	0.36
Right							
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	T	790	1688	# 0.47	0.31	519	1.52
Right	R	195	1599	0.12	0.69	1107	0.18
Northbound							
Prot							
Perm							
Left	L	317	1916	# 0.17	0.31	590	0.54
Prot							
Perm							
Thru							
Right	R	125	1538	0.08	0.31	473	0.26
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.77
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.00

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.62	0.54	11.9	1.000	373	0.20	3.1	0.0	15.0	B		
T	0.36	0.54	8.6	1.000	946	0.11	0.2	0.0	8.8	A	11.3	B
Westbound												
T	1.52	0.31	22.5	1.000	519	0.50	244.7	0.0	267.2	F	215.0	F
R	0.18	0.69	3.5	1.000	1107	0.11	0.1	0.0	3.6	A		
Northbound												
L	0.54	0.31	18.7	1.000	590	0.14	1.0	0.0	19.6	B		
											19.0	B
R	0.26	0.31	17.0	1.000	473	0.11	0.3	0.0	17.3	B		
Southbound												

Intersection delay = 113.5 (sec/veh) Intersection LOS = F

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 65.0 sec				
Total actual green time for LT lane group, G (s)	35.0			
Effective permitted green time for LT lane group, g(s)	25.0			
Opposing effective green time, go (s)	20.0			
Number of lanes in LT lane group, N	1			
Number of lanes in opposing approach, No	1			
Adjusted LT flow rate, VLT (veh/h)	231			
Proportion of LT in LT lane group, PLT	1.000			
Proportion of LT in opposing flow, PLTo	0.00			
Adjusted opposing flow rate, Vo (veh/h)	790			
Lost time for LT lane group, tL	5.00			
Computation				
LT volume per cycle, LTC=VLTC/3600	4.17			
Opposing lane util. factor, fLUo	1.000	1.000		
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	14.26			
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0			
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00			
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.69			
gq, (see Exhibit C16-4,5,6,7,8)	25.00			
gu=g-gq if gq>=gf, or = g-gf if gq<gf	0.00			
n=Max(gq-gf)/2,0)	12.50			
PTHo=1-PLTo	1.00			
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00			
EL1 (refer to Exhibit C16-3)	2.73			
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.16			
gdiff=max(gq-gf,0)	0.00			
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.16			
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.160			

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 65.0 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				
Number of lanes in LT lane group, N				

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)], (fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	65.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v		231			
v/c ratio from Capacity Worksheet, X		0.62			
Protected phase effective green interval, g (s)		10.0			
Opposing queue effective green interval, gq		21.00			
Unopposed green interval, gu		4.00			
Red time r=(C-g-gq-gu)		30.0			
Arrival rate, qa=v/(3600(max[X,1.0]))		0.06			
Protected ph. departure rate, Sp=s/3600		0.473			
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)		0.50			
XPerm		0.80			
XProt		0.54			
Case		1			
Queue at beginning of green arrow, Qa		1.92			
Queue at beginning of unsaturated green, Qu		1.35			
Residual queue, Qr		0.00			
Uniform Delay, d1		11.9			

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00		11.9	0.00	0.0	0.0	15.0
T	0.0	0.00	15.0	8.6	0.00	0.0	0.0	8.8
	0.0						0.0	
Westbound								
	0.0						0.0	
T	0.0	0.00	22.5	22.5	0.00	67.8	0.0	267.2
R	0.0	0.00	10.0	3.5	0.00	0.0	0.0	3.6
Northbound								
L	0.0	0.00	22.5	18.7	0.00	0.0	0.0	19.6
	0.0						0.0	
R	0.0	0.00	22.5	17.0	0.00	0.0	0.0	17.3
Southbound								
	0.0						0.0	
	0.0						0.0	
	0.0						0.0	

Intersection Delay 113.5 sec/veh Intersection LOS F

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	T			T	R	L		R			
Init Queue	0.0	0.0			0.0	0.0	0.0		0.0			
Flow Rate	231	339			790	195	317		125			
So	1900	1900			1900	1900	1900		1900			
No.Lanes	1	1	0	0	1	1	1	0	1	0	0	0
SL	691	1756			1688	1599	1916		1538			
LnCapacity	373	946			519	1107	590		473			
Flow Ratio	0.3	0.2			0.5	0.1	0.2		0.1			
v/c Ratio	0.62	0.36			1.52	0.18	0.54		0.26			
Grn Ratio	0.54	0.54			0.31	0.69	0.31		0.31			
I Factor		1.000			1.000			1.000				
AT or PVG	3	3			3	3	3		3			
Pltn Ratio	1.00	1.00			1.00	1.00	1.00		1.00			
PF2	1.00	1.00			1.00	1.00	1.00		1.00			
Q1	2.1	3.5			14.3	1.2	4.7		1.7			
kB	0.3	0.5			0.4	0.6	0.4		0.4			
Q2	0.5	0.3			35.0	0.1	0.5		0.1			
Q Average	2.6	3.8			49.2	1.4	5.2		1.8			
Q Spacing	24.9	24.9			24.9	25.0	24.9		24.9			
Q Storage	0	0			0	0	0		0			
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2			1.1	1.2	1.2		1.2			
BOQ	3.1	4.5			55.6	1.6	6.2		2.2			
QSRatio												
85th Percentile Output:												
fB%	1.6	1.6			1.4	1.6	1.6		1.6			
BOQ	4.1	6.0			66.8	2.2	8.1		2.9			
QSRatio												
90th Percentile Output:												
fB%	1.8	1.7			1.4	1.8	1.7		1.8			
BOQ	4.6	6.6			70.6	2.4	8.9		3.2			
QSRatio												
95th Percentile Output:												
fB%	2.0	2.0			1.5	2.1	1.9		2.0			
BOQ	5.3	7.6			75.7	2.8	10.2		3.7			
QSRatio												
98th Percentile Output:												
fB%	2.5	2.4			1.7	2.6	2.4		2.6			
BOQ	6.6	9.3			84.8	3.5	12.4		4.7			
QSRatio												

ERROR MESSAGES

No errors to report.

HCS+: Signalized Intersections Release 5.5

Analyst: MDN
Agency: CME, RL11NBbupmi
Date: 1/25/11
Period: PM PH of AST
Project ID: 112-091, GF Malta TIS
E/W St: Round Lake Road

Inter.: Round Lake Road / Exit 11 NB
Area Type: All other areas
Jurisd: Malta, Saratoga County
Year : 2022 Buildcwith Imp

N/S St: Exit 11 NB

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Volume	215	315			735	190	295		160			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						9			44			

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A	A			NB	Left	A			
	Thru	A	A				Thru				
	Right						Right	A			
	Peds						Peds				
WB	Left					SB	Left				
	Thru		A				Thru				
	Right		A				Right				
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right	A			
Green		10.0	40.0					20.0			
Yellow		3.0	3.0					3.0			
All Red		2.0	2.0					2.0			

Cycle Length: 85.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	285	1702	0.81	0.65	38.2	D		
T	1136	1756	0.30	0.65	6.7	A	19.5	B
Westbound								
T	794	1688	0.99	0.47	53.0	D	43.1	D
R	1223	1599	0.16	0.76	2.7	A		
Northbound								
L	451	1916	0.70	0.24	34.7	C		
							32.7	C
R	362	1538	0.35	0.24	27.6	C		
Southbound								

Intersection Delay = 34.0 (sec/veh) Intersection LOS = C

HCS+: Signalized Intersections Release 5.5

Creighton Manning Engineering, LLP
Engineers, Planners, & Surveyors
4 Automation Lane
Albany, NY 12205

Phone: (518) 446-0396 Fax: (518) 446-0397
E-Mail: cme@cmellp.com

OPERATIONAL ANALYSIS

Analyst: MDN
Agency/Co.: CME, RL11NBbupmi
Date Performed: 1/25/11
Analysis Time Period: PM PH of AST
Intersection: Round Lake Road / Exit 11 NB
Area Type: All other areas
Jurisdiction: Malta, Saratoga County
Analysis Year: 2022 Buildcwith Imp
Project ID: 112-091, GF Malta TIS
E/W St: Round Lake Road N/S St: Exit 11 NB

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	215	315			735	190	295		160			
% Heavy Veh	0	2			4	0	1		2			
PHF	0.93	0.93			0.93	0.93	0.93		0.93			
PK 15 Vol	58	85			198	51	79		43			
Hi Ln Vol												
% Grade		-2			2			-1				
Ideal Sat	1900	1900			1900	1900	1900		1900			
ParkExist												
NumPark												
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
LGConfig	L	T			T	R	L		R			
Lane Width	10.0	10.0			10.0	12.0	14.0		11.0			
RTOR Vol						9			44			
Adj Flow	231	339			790	195	317		125			
%InSharedLn												
Prop LTs	1.000	0.000			0.000							
Prop RTs		0.000		0.000		1.000			1.000			
Peds Bikes				0			0			6		
Buses	0	0			0	0	0		0			
%InProtPhase	0.0											
Duration	0.25											

Area Type: All other areas

OPERATING PARAMETERS

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

PHASE DATA

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	A	A			NB Left	A		
	Thru	A	A			Thru			
	Right					Right	A		
	Peds					Peds			
WB	Left					SB Left			
	Thru		A			Thru			
	Right		A			Right			
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right	A		
Green		10.0	40.0				20.0		
Yellow		3.0	3.0				3.0		
All Red		2.0	2.0				2.0		

Cycle Length: 85.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	215	315			735	190	295		160			
PHF	0.93	0.93			0.93	0.93	0.93		0.93			
Adj flow	231	339			790	195	317		125			
No. Lanes	1	1	0	0	1	1	1	0	1	0	0	0
Lane group	L	T			T	R	L		R			
Adj flow	231	339			790	195	317		125			
Prop LTs	1.000	0.000			0.000							
Prop RTs	0.000			0.000	1.000				1.000			

Saturation Flow Rate (see Exhibit 16-7 to determine the adjustment factors)

	Eastbound				Westbound		Northbound				Southbound		
LG	L	T			T	R	L		R				
So	1900	1900			1900	1900	1900		1900				
Lanes	1	1	0	0	1	1	1	0	1	0	0	0	
fW	0.933	0.933			0.933	1.000	1.067		0.967				
fHV	1.000	0.980			0.962	1.000	0.990		0.980				
fG	1.010	1.010			0.990	0.990	1.005		1.005				
fP	1.000	1.000			1.000	1.000	1.000		1.000				
fBB	1.000	1.000			1.000	1.000	1.000		1.000				
fA	1.000	1.000			1.000	1.000	1.000		1.000				
fLU	1.000	1.000			1.000	1.000	1.000		1.000				
fRT		1.000			1.000	0.850			0.850				
fLT	0.950	1.000			1.000		0.950						
Sec.	0.089												
fLpb	1.000	1.000			1.000		1.000						
fRpb		1.000			1.000	1.000			1.000				
S	1702	1756			1688	1599	1916		1538				
Sec.	159												

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot		200	1702	# 0.12	0.118	200	1.00
Perm		31	159	0.19	0.529	85	0.36
Left	L	231			0.65	285	0.81
Prot							
Perm							
Thru	T	339	1756	0.19	0.65	1136	0.30
Right							
Westbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	T	790	1688	# 0.47	0.47	794	0.99
Right	R	195	1599	0.12	0.76	1223	0.16
Northbound							
Prot							
Perm							
Left	L	317	1916	# 0.17	0.24	451	0.70
Prot							
Perm							
Thru							
Right	R	125	1538	0.08	0.24	362	0.35
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru							
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.75
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.91

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.81	0.65	22.2	1.000	285	0.35	16.0	0.0	38.2	D		
T	0.30	0.65	6.6	1.000	1136	0.11	0.1	0.0	6.7	A	19.5	B
Westbound												
T	0.99	0.47	22.4	1.000	794	0.50	30.6	0.0	53.0	D	43.1	D
R	0.16	0.76	2.7	1.000	1223	0.11	0.1	0.0	2.7	A		
Northbound												
L	0.70	0.24	29.8	1.000	451	0.27	4.9	0.0	34.7	C		
											32.7	C
R	0.35	0.24	27.1	1.000	362	0.11	0.6	0.0	27.6	C		
Southbound												

Intersection delay = 34.0 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	85.0 sec				
Total actual green time for LT lane group, G (s)		55.0			
Effective permitted green time for LT lane group, g(s)		45.0			
Opposing effective green time, go (s)		40.0			
Number of lanes in LT lane group, N		1			
Number of lanes in opposing approach, No		1			
Adjusted LT flow rate, VLT (veh/h)		231			
Proportion of LT in LT lane group, PLT		1.000			
Proportion of LT in opposing flow, PLTo		0.00			
Adjusted opposing flow rate, Vo (veh/h)		790			
Lost time for LT lane group, tL		5.00			
Computation					
LT volume per cycle, LTC=VLTC/3600		5.45			
Opposing lane util. factor, fLUo		1.000	1.000		
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)		18.65			
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g		0.0			
Opposing platoon ratio, Rpo (refer Exhibit 16-11)		1.00			
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]		0.53			
gq, (see Exhibit C16-4,5,6,7,8)		35.20			
gu=g-gq if gq>=gf, or = g-gf if gq<gf		9.80			
n=Max(gq-gf)/2,0)		17.60			
PTHo=1-PLTo		1.00			
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]		1.00			
EL1 (refer to Exhibit C16-3)		2.73			
EL2=Max((1-Ptho**n)/Plto, 1.0)					
fmin=2(1+PL)/g or fmin=2(1+Pl)/g		0.09			
gdiff=max(gq-gf,0)		0.00			
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)		0.09			
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT		0.089			

For special case of single-lane approach opposed by multilane approach, see text.

* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.

** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.

For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach					
Cycle length, C	85.0 sec				
Total actual green time for LT lane group, G (s)					
Effective permitted green time for LT lane group, g(s)					
Opposing effective green time, go (s)					
Number of lanes in LT lane group, N					

Number of lanes in opposing approach, No
Adjusted LT flow rate, VLT (veh/h)
Proportion of LT in LT lane group, PLT 0.000 0.000
Proportion of LT in opposing flow, PLTo
Adjusted opposing flow rate, Vo (veh/h)
Lost time for LT lane group, tL
Computation
LT volume per cycle, LTC=VLTC/3600
Opposing lane util. factor, fLUo 1.000 1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g
Opposing platoon ratio, Rpo (refer Exhibit 16-11)
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]
gq, (see Exhibit C16-4,5,6,7,8)
gu=g-gq if gq>=gf, or = g-gf if gq<gf
n=Max(gq-gf)/2,0)
PTHo=1-PLTo
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]
EL1 (refer to Exhibit C16-3)
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g or fmin=2(1+Pl)/g
gdiff=max(gq-gf,0)
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)], (fmin<=fm<=1.00)
or flt=[fm+0.91(N-1)]/N**
Left-turn adjustment, fLT

For special case of single-lane approach opposed by multilane approach, see text.
* If Pl>=1 for shared left-turn lanes with N>1, then assume de-facto left-turn lane and redo calculations.
** For permitted left-turns with multiple exclusive left-turn lanes, flt=fm.
For special case of multilane approach opposed by single-lane approach or when gf>gq, see text.

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

	EB	WB	NB	SB
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Pedestrian flow rate, Vpedg (p/h)				
OCCpedg				
Opposing queue clearing green, gq (s)				
Eff. ped. green consumed by opp. veh. queue, gq/gp				
OCCpedu				
Opposing flow rate, Vo (veh/h)				
OCCr				
Number of cross-street receiving lanes, Nrec				
Number of turning lanes, Nturn				
ApbT				
Proportion of left turns, PLT				
Proportion of left turns using protected phase, PLTA				
Left-turn adjustment, fLpb				
Permitted Right Turns				
Effective pedestrian green time, gp (s)				
Conflicting pedestrian volume, Vped (p/h)				
Conflicting bicycle volume, Vbic (bicycles/h)				
Vpedg				
OCCpedg				
Effective green, g (s)				
Vbicg				

OCCbicg
OCCr
Number of cross-street receiving lanes, Nrec
Number of turning lanes, Nturn
ApbT
Proportion right-turns, PRT
Proportion right-turns using protected phase, PRTA
Right turn adjustment, fRpb

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	85.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v		231			
v/c ratio from Capacity Worksheet, X		0.81			
Protected phase effective green interval, g (s)		10.0			
Opposing queue effective green interval, gq		35.20			
Unopposed green interval, gu		9.80			
Red time r=(C-g-gq-gu)		30.0			
Arrival rate, qa=v/(3600(max[X,1.0]))		0.06			
Protected ph. departure rate, Sp=s/3600		0.473			
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)		0.20			
XPerm		1.45			
XProt		0.54			
Case		3			
Queue at beginning of green arrow, Qa		2.82			
Queue at beginning of unsaturated green, Qu		2.26			
Residual queue, Qr		0.90			
Uniform Delay, d1		22.2			

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
L	0.0	0.00		22.2	0.00	0.0	0.0	38.2
T	0.0	0.00	15.0	6.6	0.00	0.0	0.0	6.7
	0.0						0.0	
Westbound								
	0.0						0.0	
T	0.0	0.00	22.5	22.4	0.00	0.0	0.0	53.0
R	0.0	0.00	10.0	2.7	0.00	0.0	0.0	2.7
Northbound								
L	0.0	0.00	32.5	29.8	0.00	0.0	0.0	34.7
	0.0						0.0	
R	0.0	0.00	32.5	27.1	0.00	0.0	0.0	27.6
Southbound								
	0.0						0.0	
	0.0						0.0	
	0.0						0.0	

Intersection Delay 34.0 sec/veh Intersection LOS C

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	T			T	R	L		R			
Init Queue	0.0	0.0			0.0	0.0	0.0		0.0			
Flow Rate	231	339			790	195	317		125			
So	1900	1900			1900	1900	1900		1900			
No.Lanes	1	1	0	0	1	1	1	0	1	0	0	0
SL	440	1756			1688	1599	1916		1538			
LnCapacity	285	1136			794	1223	451		362			
Flow Ratio	0.5	0.2			0.5	0.1	0.2		0.1			
v/c Ratio	0.81	0.30			0.99	0.16	0.70		0.35			
Grn Ratio	0.65	0.65			0.47	0.76	0.24		0.24			
I Factor		1.000			1.000			1.000				
AT or PVG	3	3			3	3	3		3			
Pltn Ratio	1.00	1.00			1.00	1.00	1.00		1.00			
PF2	1.00	1.00			1.00	1.00	1.00		1.00			
Q1	2.1	3.5			18.6	1.2	6.9		2.5			
kB	0.3	0.7			0.6	0.8	0.4		0.4			
Q2	1.1	0.3			7.3	0.1	0.9		0.2			
Q Average	3.3	3.8			25.9	1.4	7.8		2.6			
Q Spacing	24.9	24.9			24.9	25.0	24.9		24.9			
Q Storage	0	0			0	0	0		0			
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2			1.2	1.2	1.2		1.2			
BOQ	3.9	4.5			29.8	1.6	9.2		3.2			
QSRatio												
85th Percentile Output:												
fB%	1.6	1.6			1.4	1.6	1.5		1.6			
BOQ	5.1	6.0			36.9	2.2	11.9		4.2			
QSRatio												
90th Percentile Output:												
fB%	1.7	1.7			1.5	1.8	1.7		1.8			
BOQ	5.7	6.6			39.1	2.4	13.0		4.6			
QSRatio												
95th Percentile Output:												
fB%	2.0	2.0			1.6	2.1	1.9		2.0			
BOQ	6.6	7.6			42.5	2.8	14.7		5.3			
QSRatio												
98th Percentile Output:												
fB%	2.5	2.4			1.8	2.6	2.2		2.5			
BOQ	8.1	9.3			47.6	3.6	17.5		6.7			
QSRatio												

ERROR MESSAGES

No errors to report.

Comment 1-59:

US Route 9/NY Route 67/Dunning Street Intersection Evaluation
- Sensitivity Analysis Level of Service Reports
-Original Improvement/Concept Figure

LANE SUMMARY

Site: Route 9/Route 67/Dunning Street - AM Peak - Build 2022 - EB/WB - B

Route 9/Route 67/Dunning Street
Build 2022 with Imp
AM Peak Hour
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap veh/h	Deg Satn v/c	Lane Util %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	St. Type	Cap Adj %	Prob. Block. %
South: Route 9 NB																
Lane 1	184	99	0	283	3.0	707	0.400	100	10.4	LOS B	2.3	58.0	2500	–	0.0	0.0
Lane 2	0	215	79	294	3.0	736	0.400	100	10.1	LOS B	2.3	58.6	2500	–	0.0	0.0
Approach	184	314	79	577	3.0		0.400		10.3	LOS B	2.3	58.6				
East: Dunning Street WB																
Lane 1	164	223	0	387	0.4	761	0.509	100	12.1	LOS B	3.2	80.4	350	–	0.0	0.0
Lane 2	0	335	70	404	0.3	795	0.509	100	11.7	LOS B	3.2	81.3	1600	–	0.0	0.0
Approach	164	558	70	792	0.4		0.509		11.9	LOS B	3.2	81.3				
North: Route 9 SB																
Lane 1	110	330	0	441	3.0	618	0.713	100	22.5	LOS C	5.7	145.1	725	–	0.0	0.0
Lane 2	0	228	252	480	2.4	674	0.713	100	21.1	LOS C	5.9	149.2	725	–	0.0	0.0
Approach	110	558	252	921	2.7		0.713		21.8	LOS C	5.9	149.2				
West: Route 67 EB																
Lane 1	184	246	0	430	3.0	619	0.694	100	21.4	LOS C	5.6	144.2	1225	–	0.0	0.0
Lane 2	0	138	331	469	1.7	676	0.694	100	20.0	LOS B	5.8	147.7	1225	–	0.0	0.0
Approach	184	384	331	899	2.3		0.694		20.7	LOS C	5.8	147.7				
Intersection				3188	2.1		0.713		16.9	LOS B	5.9	149.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Model used. Geometric Delay not included.

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SIDRA INTERSECTION

LANE SUMMARY

Site: Route 9/Route 67/Dunning Street - PM Peak - Build 2022 - EB/WB - B

Route 9/Route 67/Dunning Street
Build 2022
PM Peak Hour
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob Block %
South: Route 9 NB																
Lane 1	303	262	0	565	0.9	596	0.949	100	51.3	LOS D	14.4	363.3	2500	–	0.0	0.0
Lane 2	0	458	145	604	1.5	636	0.949	100	49.3	LOS D	15.0	378.3	2500	–	0.0	0.0
Approach	303	720	145	1169	1.2		0.949		50.3	LOS D	15.0	378.3				
East: Dunning Street WB																
Lane 1	139	225	0	364	0.6	400	0.911	100	57.5	LOS E	10.0	250.8	350	–	0.0	0.0
Lane 2	0	264	157	421	0.6	462	0.911	100	52.3	LOS D	10.9	272.7	1600	–	0.0	0.0
Approach	139	489	157	785	0.6		0.911		54.7	LOS D	10.9	272.7				
North: Route 9 SB																
Lane 1	123	274	0	397	1.4	586	0.678	100	21.5	LOS C	5.4	136.0	725	–	0.0	0.0
Lane 2	0	209	215	424	2.0	626	0.678	100	20.4	LOS C	5.5	140.4	725	–	0.0	0.0
Approach	123	484	215	822	1.7		0.678		20.9	LOS C	5.5	140.4				
West: Route 67 EB																
Lane 1	320	195	0	516	0.4	708	0.728	100	21.1	LOS C	6.5	164.1	1225	–	0.0	0.0
Lane 2	0	294	229	523	2.3	718	0.728	100	20.9	LOS C	6.6	167.5	1225	–	0.0	0.0
Approach	320	489	229	1039	1.4		0.728		21.0	LOS C	6.6	167.5				
Intersection				3814	1.2		0.949		36.9	LOS D	15.0	378.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Model used. Geometric Delay not included.

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SIDRA INTERSECTION

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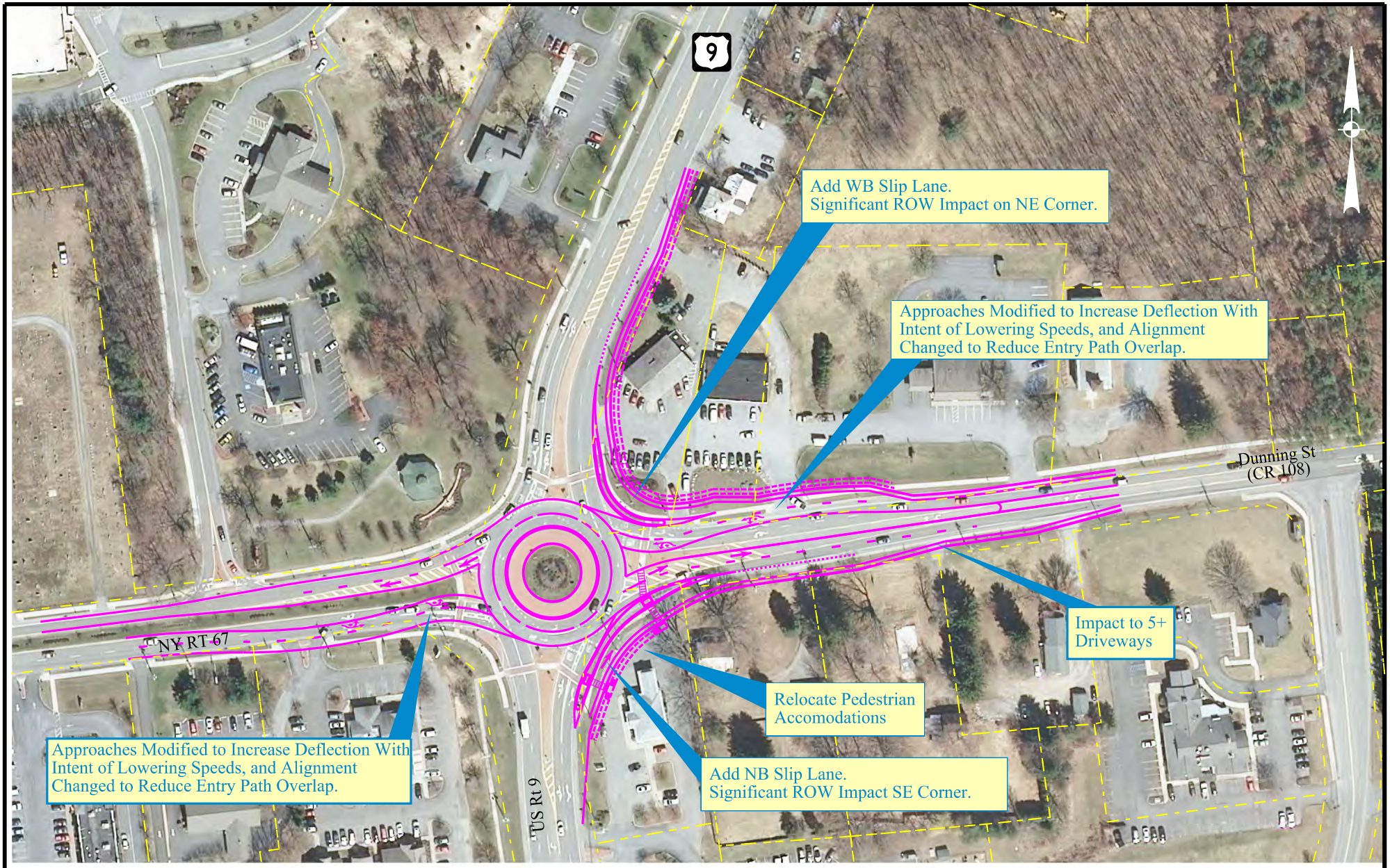

75 0 75 150 225 300'

1" = 150'

NY RTE 67/DUNNING STREET
AND US ROUTE 9 IMPROVEMENTS

GLOBALFOUNDRIES DEVELOPMENT
TOWNS OF MALTA AND STILLWATER, NEW YORK

Creighton Manning

PROJECT: 112-118 | DATE: 4/2013 | FIGURE: C