

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)
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)	(2)	(3)
	Single-stage Process	Two-Stage Process Stage I	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		0	1224						
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		3000						
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		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1

Conflicting Flows	0	
Potential Capacity	1597	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1597	
Probability of Queue free St.	0.99	1.00
Maj L-Shared Prob Q free St.	0.99	

---

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	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00

---

Step 4: LT from Minor St. 7 10

---

Conflicting Flows	1224	
Potential Capacity	200	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity	199	

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	0.99	0.99
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	1224	
Potential Capacity	200	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		1.00

Cap. Adj. factor due to Impeding mvmnt            0.99                    1.00  
 Movement Capacity                                    199

Results for Two-stage process:

a  
 Y  
 C t    199

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	6					
Movement Capacity (vph)	199					
Shared Lane Capacity (vph)						

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	199					
Volume	6					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		10	6					
C(m) (vph)		1597	199					
v/c		0.01	0.03					
95% queue length		0.02	0.09					
Control Delay		7.3	23.7					
LOS		A	C					
Approach Delay				23.7				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(i1), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

## 1.1.1 Memória de cálculo da análise de capacidade e níveis de serviço – Cenário SEM O EMPREENDIMENTO

### 1.1.1.1 Interseção B – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

#### TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: B  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2  
 North/South Street: M7  
 Intersection Orientation: EW Study period (hrs): 1.00

		Vehicle Volumes and Adjustments					
Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume					9	724	
Peak-Hour Factor, PHF					0.91	0.91	
Hourly Flow Rate, HFR					9	795	
Percent Heavy Vehicles		--	--		12	--	--
Median Type/Storage		Undivided			/		
RT Channelized?							
Lanes					0	2	
Configuration					LT	T	
Upstream Signal?			No			No	

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		13					
Peak Hour Factor, PHF		0.91					
Hourly Flow Rate, HFR		14					
Percent Heavy Vehicles		0					
Percent Grade (%)			0			0	
Flared Approach: Exists?/Storage				/	/		/
Lanes		1					
Configuration		L					

		Delay, Queue Length, and Level of Service					
Approach Movement	EB 1	Northbound			Southbound		
		WB 4	7 L	8 L	9 L	10 L	11 L
Lane Config		LT	L				
v (vph)		9	14				
C(m) (vph)		1560	595				
v/c		0.01	0.02				
95% queue length		0.02	0.07				
Control Delay		7.3	11.2				
LOS		A	B				
Approach Delay				11.2			
Approach LOS				B			

HCS+: Unsignalized Intersections Release 5.6

Phone:  
E-Mail:

Fax:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: B  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2  
 North/South Street: M7  
 Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume				9	724	
Peak-Hour Factor, PHF				0.91	0.91	
Peak-15 Minute Volume				2	199	
Hourly Flow Rate, HFR				9	795	
Percent Heavy Vehicles		--	--	12	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration				LT	T	
Upstream Signal?	No			No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	13					
Peak Hour Factor, PHF	0.91					
Peak-15 Minute Volume	4					
Hourly Flow Rate, HFR	14					
Percent Heavy Vehicles	0					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		/	
RT Channelized						
Lanes	1					
Configuration	L					

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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:	0
Shared ln volume, major rt vehicles:	0
Sat flow rate, major th vehicles:	1700
Sat flow rate, major rt vehicles:	1700
Number of major street through lanes:	2

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					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		12	0					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
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	6.4					
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					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		12	0					
t(f)		2.3	3.5					

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

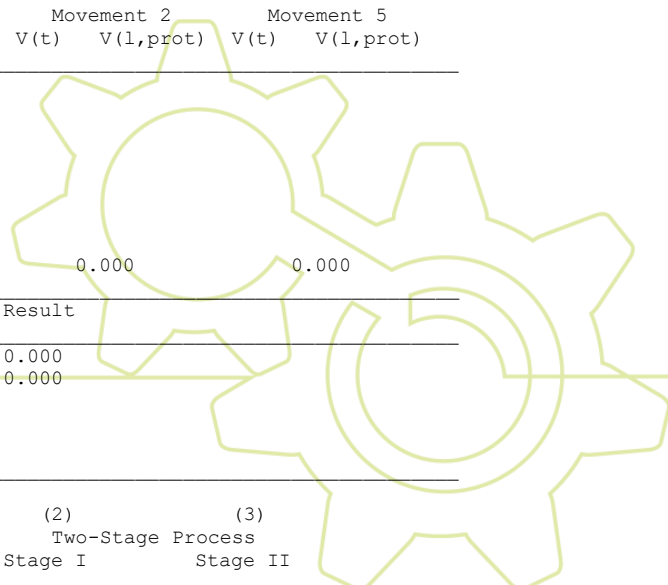
0.000 0.000

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
-----------------------------	-------------------------------------	--------------------------------------





---

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 0.99 0.99  
 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 415  
 Potential Capacity 598  
 Pedestrian Impedance Factor 1.00 1.00  
 Maj. L, Min T Impedance factor 0.99  
 Maj. L, Min T Adj. Imp Factor. 1.00  
 Cap. Adj. factor due to Impeding mvmnt 0.99 1.00  
 Movement Capacity 595

---

Results for Two-stage process:  
 a  
 Y  
 C t  
 595

---

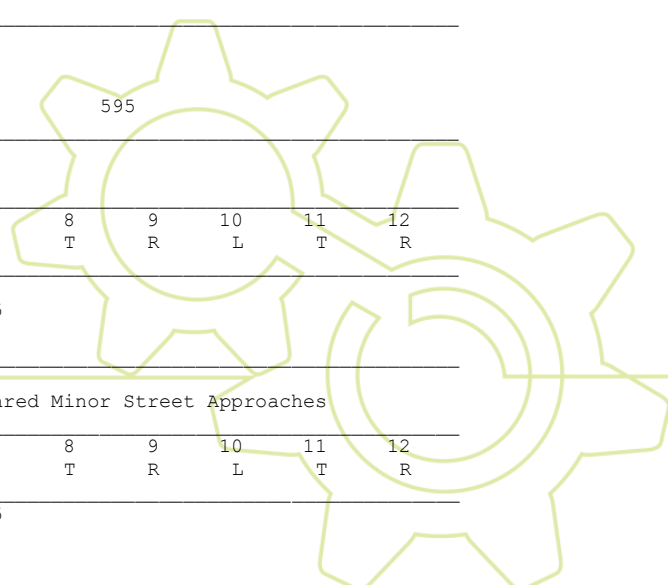
Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	14					
Movement Capacity (vph)	595					
Shared Lane Capacity (vph)						

---

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	595					
Volume	14					
Delay						





Q sep  
Q sep +1  
round (Qsep +1)

n max  
C sh  
SUM C sep  
n  
C act

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		9	14					
C(m) (vph)		1560	595					
v/c		0.01	0.02					
95% queue length		0.02	0.07					
Control Delay		7.3	11.2					
LOS		A	B					
Approach Delay				11.2				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(i1), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.2 Interseção B – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
Agency/Co.:  
Date Performed: 05/06/2023  
Analysis Time Period: Pico Tarde  
Intersection: B  
Jurisdiction: DER/DF  
Units: U. S. Metric  
Analysis Year: 2023  
Project ID: ATUAL SEM EMPREENDIMENTO  
East/West Street: M2  
North/South Street: M7  
Intersection Orientation: EW

Study period (hrs): 1.00

Major Street: Approach	Vehicle Volumes and Adjustments					
	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				12	1989	
Peak-Hour Factor, PHF				0.91	0.91	
Hourly Flow Rate, HFR				13	2185	
Percent Heavy Vehicles	--	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration					LT T	
Upstream Signal?					No	

Minor Street: Approach	Vehicle Volumes and Adjustments					
	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume						
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Median Type/Storage						
RT Channelized?						
Lanes						
Configuration						
Upstream Signal?						

Volume	17
Peak Hour Factor, PHF	0.91
Hourly Flow Rate, HFR	18
Percent Heavy Vehicles	20
Percent Grade (%)	0
Flared Approach: Exists?/Storage	/
Lanes	1
Configuration	L

Delay, Queue Length, and Level of Service									
Approach	EB	WB	Northbound				Southbound		
Movement	1	4	7	8	9	10	11	12	
Lane Config		LT	L						
v (vph)		13	18						
C(m) (vph)		1636	209						
v/c		0.01	0.09						
95% queue length		0.02	0.28						
Control Delay		7.2	23.8						
LOS		A	C						
Approach Delay				23.8					
Approach LOS				C					

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:  
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: B  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2  
 North/South Street: M7  
 Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments						
Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				12	1989	
Peak-Hour Factor, PHF				0.91	0.91	
Peak-15 Minute Volume				3	546	
Hourly Flow Rate, HFR				13	2185	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration				LT	T	
Upstream Signal?	No			No		
Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	17					
Peak Hour Factor, PHF	0.91					
Peak-15 Minute Volume	5					
Hourly Flow Rate, HFR	18					
Percent Heavy Vehicles	20					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/

RT Channelized  
Lanes 1  
Configuration L

Pedestrian Volumes and Adjustments				
Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	20					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
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	6.6					
2-stage								

Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	20					
t(f)		2.2	3.7					

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)				





Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	209	

Results for Two-stage process:

a	
Y	
C t	209

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	18					
Movement Capacity (vph)	209					
Shared Lane Capacity (vph)						

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	209					
Volume	18					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		13	18					
C (m) (vph)		1636	209					
v/c		0.01	0.09					
95% queue length		0.02	0.28					
Control Delay		7.2	23.8					
LOS		A	C					
Approach Delay				23.8				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(i1), Volume for stream 2 or 5	0	0
v(i2), Volume for stream 3 or 6	0	0
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.99	0.99
d(M,LT), Delay for stream 1 or 4	7.2	7.2
N, Number of major street through lanes	2	2
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.3 Interseção C – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	Progeplan
Agency/Co.:	
Date Performed:	05/06/2023

Analysis Time Period: Pico Manha  
 Intersection: C  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: MOV01-MOV05-MOV07  
 North/South Street: MOV08  
 Intersection Orientation: EW  
 Study period (hrs): 1.00

Vehicle Volumes and Adjustments								
Major Street:	Approach Movement	Eastbound				Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R	
Volume		39	1764					
Peak-Hour Factor, PHF		0.91	0.91					
Hourly Flow Rate, HFR		42	1938					
Percent Heavy Vehicles		0	--	--		--	--	
Median Type/Storage		Undivided			/			
RT Channelized?								
Lanes		0	2					
Configuration		LT T						
Upstream Signal?			No			No		

Minor Street:	Approach Movement	Northbound				Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R	
Volume					9			
Peak Hour Factor, PHF					0.91			
Hourly Flow Rate, HFR					9			
Percent Heavy Vehicles					12			
Percent Grade (%)		0				0		
Flared Approach: Exists?/Storage					/			/
Lanes						1		
Configuration						L		

Delay, Queue Length, and Level of Service										
Approach Movement	EB	WB	Northbound				Southbound			
			1	4	7	8	9	10	11	12
Lane Config	LT							L		
v (vph)	42							9		
C(m) (vph)	1636							234		
v/c	0.03							0.04		
95% queue length	0.08							0.12		
Control Delay	7.3							21.0		
LOS	A							C		
Approach Delay									21.0	
Approach LOS									C	

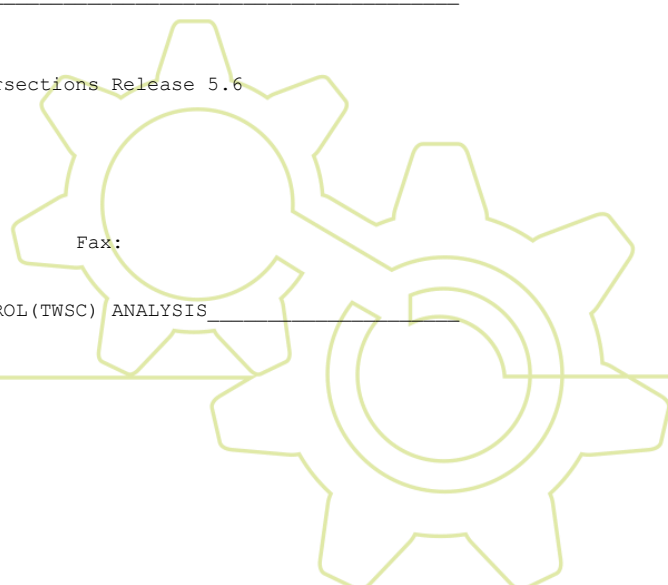
HCS+: Unsignalized Intersections Release 5.6

Phone:  
E-Mail:

Fax:

TWO-WAY STOP CONTROL (TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: C  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: MOV01-MOV05-MOV07



North/South Street: MOV08  
Intersection Orientation: EW

Study period (hrs): 1.00

Major Street Movements	Vehicle Volumes and Adjustments					
	1 L	2 T	3 R	4 L	5 T	6 R
Volume	39	1764				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	11	485				
Hourly Flow Rate, HFR	42	1938				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				9		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				2		
Hourly Flow Rate, HFR				9		
Percent Heavy Vehicles				12		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes				1		
Configuration				L		

Movements	Pedestrian Volumes and Adjustments			
	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)	4.1					7.1		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					12		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		
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      6.5  
            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		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					12		
t(f)	2.2					3.6		

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) Process Stage II
--	-----------------------------	----------------------------------	-------------------------

p(1)  
p(4)  
p(7)  
p(8)  
p(9)  
p(10)  
p(11)  
p(12)

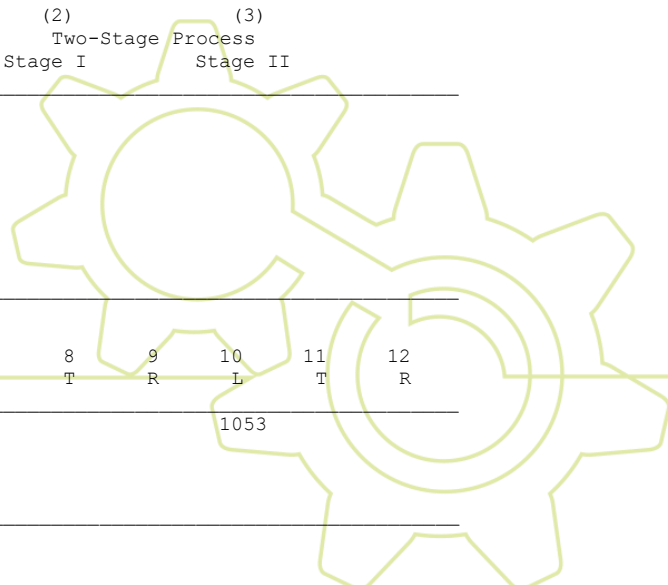
Computation 4 and 5  
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
----------	--------	--------	--------	--------	--------	---------	---------	---------

V c,x      0      1053

s  
Px  
V c,u,x

C r,x  
C plat,x



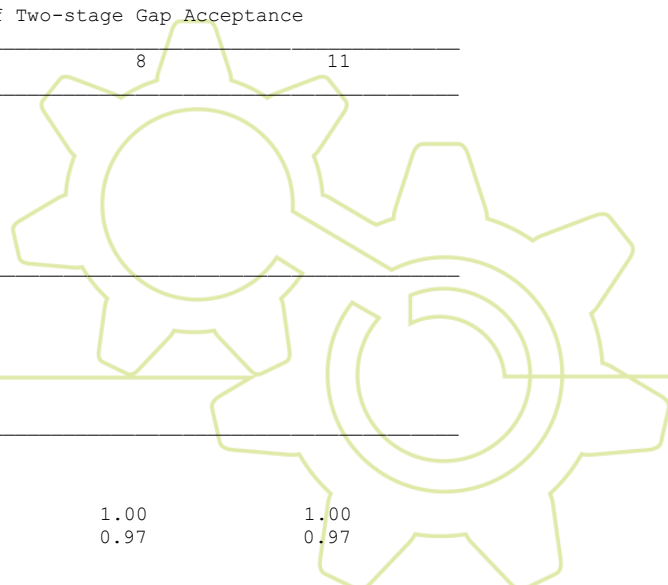
Two-Stage Process		7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	
V(c,x)						3000			
s									
P(x)									
V(c,u,x)									
C(r,x)									
C(plat,x)									

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.						9		12
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor						1.00		1.00
Movement Capacity								
Probability of Queue free St.						1.00		1.00
Step 2: LT from Major St.						4		1
Conflicting Flows								0
Potential Capacity								1636
Pedestrian Impedance Factor						1.00		1.00
Movement Capacity								1636
Probability of Queue free St.						1.00		0.97
Maj L-Shared Prob Q free St.								0.97
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						0.97		0.97
Movement Capacity								
Probability of Queue free St.						1.00		1.00
Step 4: LT from Minor St.						7		10
Conflicting Flows								1053
Potential Capacity								240
Pedestrian Impedance Factor						1.00		1.00
Maj. L, Min T Impedance factor						0.97		
Maj. L, Min T Adj. Imp Factor.						0.98		
Cap. Adj. factor due to Impeding mvmnt						0.98		0.97
Movement Capacity								234

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						0.97		0.97
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
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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		1053
Potential Capacity		240
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.97
Movement Capacity		234

Results for Two-stage process:

a	
y	
C t	234

Worksheet 8-Shared Lane Calculations

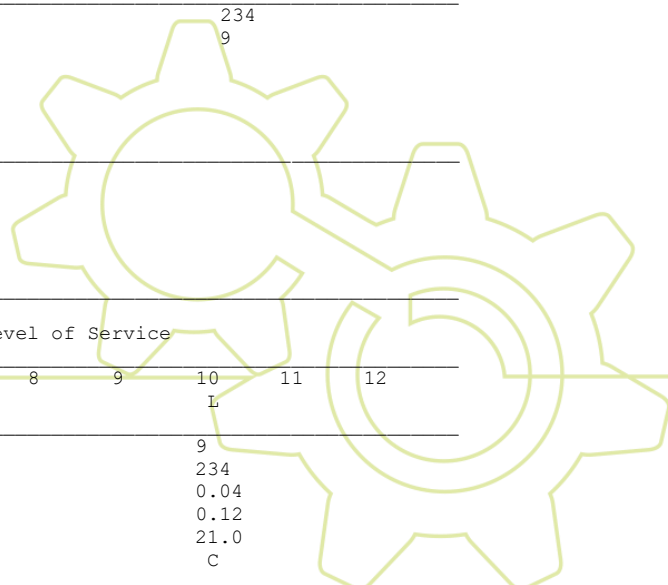
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				9		
Movement Capacity (vph)				234		
Shared Lane Capacity (vph)						

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				234		
Volume				9		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	42					9		
C(m) (vph)	1636					234		
v/c	0.03					0.04		
95% queue length	0.08					0.12		
Control Delay	7.3					21.0		
LOS	A					C		







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:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

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		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	21					0		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		
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	4.3					6.4		
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		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	21					0		
t(f)	2.4					3.5		

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 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
--	--------	--------	--------	--------	--------	---------	---------	---------

V c,x	0					441		
s								
Px								
V c,u,x								

C r,x  
C plat,x

Two-Stage Process

	7 Stage1 Stage2		8 Stage1 Stage2		10 Stage1 Stage2		11 Stage1 Stage2	
--	--------------------	--	--------------------	--	---------------------	--	---------------------	--

V(c,x)								
s					3000			
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
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Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
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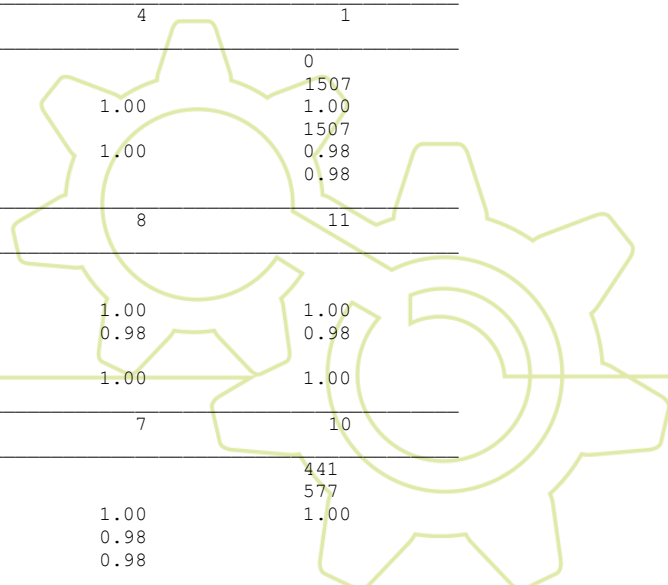
Conflicting Flows		0
Potential Capacity		1507
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1507
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.98

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	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
---------------------------	---	----

Conflicting Flows		441
Potential Capacity		577
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	



Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		565

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	0.98	0.98
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		441
Potential Capacity		577
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		565

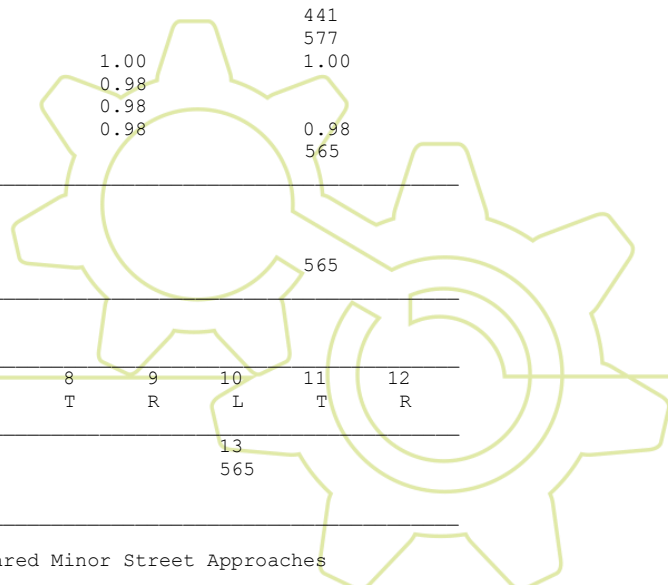
Results for Two-stage process:  
 a  
 y  
 C t

	565
--	-----

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				13		
Movement Capacity (vph)				565		
Shared Lane Capacity (vph)						

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				565		
Volume				13		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	31					13		
C(m) (vph)	1507					565		
v/c	0.02					0.02		
95% queue length	0.06					0.07		
Control Delay	7.4					11.5		
LOS	A					B		
Approach Delay							11.5	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
d(M,LT), Delay for stream 1 or 4	7.4	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.5 Interseção E – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: G  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2-M7+M8-M11+M12-M13  
 North/South Street: M13  
 Intersection Orientation: EW  
 Study period (hrs): 1.00

Major Street: Approach	Vehicle Volumes and Adjustments					
	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				5	685	
Peak-Hour Factor, PHF				0.91	0.91	
Hourly Flow Rate, HFR				5	752	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						

Lanes Configuration						0	2
Upstream Signal?	No					LT	T
Minor Street: Approach		Northbound				Southbound	
Movement	7	8	9		10	11	12
	L	T	R		L	T	R
Volume	6						
Peak Hour Factor, PHF	0.91						
Hourly Flow Rate, HFR	6						
Percent Heavy Vehicles	11						
Percent Grade (%)	0					0	
Flared Approach: Exists?/Storage Lanes	1			/			/
Configuration	L						

Delay, Queue Length, and Level of Service										
Approach	EB	WB	Northbound				Southbound			
Movement	1	4		7	8	9		10	11	12
Lane Config		LT		L						
v (vph)	5		6							
C(m) (vph)	1636		598							
v/c	0.00		0.01							
95% queue length	0.01		0.03							
Control Delay	7.2		11.1							
LOS	A		B							
Approach Delay					11.1					
Approach LOS					B					

HCS+: Unsignalized Intersections Release 5.6

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
E-Mail: \_\_\_\_\_

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.: \_\_\_\_\_  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: G  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2-M7+M8-M11+M12-M13  
 North/South Street: M13  
 Intersection Orientation: EW  
 Study period (hrs): 1.00

Major Street Movements	Vehicle Volumes and Adjustments					
	1	2	3	4	5	6
	L	T	R	L	T	R
Volume			5		685	
Peak-Hour Factor, PHF			0.91		0.91	
Peak-15 Minute Volume			1		188	
Hourly Flow Rate, HFR			5		752	
Percent Heavy Vehicles			0		--	
Median Type/Storage	Undivided					
RT Channelized?						
Lanes Configuration					0	2
Upstream Signal?					LT	T
					No	
Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R

Volume 6  
 Peak Hour Factor, PHF 0.91  
 Peak-15 Minute Volume 2  
 Hourly Flow Rate, HFR 6  
 Percent Heavy Vehicles 11  
 Percent Grade (%) 0 / 0  
 Flared Approach: Exists?/Storage /  
 RT Channelized  
 Lanes 1  
 Configuration L

Pedestrian Volumes and Adjustments				
Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	11					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
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	6.5					
2-stage								

Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	11					
t(f)		2.2	3.6					

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal				
	Movement 2		Movement 5	
V prog	V(t)	V(l,prot)	V(t)	V(l,prot)
Total Saturation Flow Rate, s (vph)				



Movement Capacity		
Probability of Queue free St.	1.00	1.00

---

Step 2: LT from Major St.	4	1
---------------------------	---	---

Conflicting Flows	0	
Potential Capacity	1636	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1636	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	

---

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	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

---

Step 4: LT from Minor St.	7	10
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Conflicting Flows	386	
Potential Capacity	600	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	598	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

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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	1.00	1.00
Movement Capacity		

Result for 2 stage process:

a		
y		
C t		
Probability of Queue free St.	1.00	1.00

---

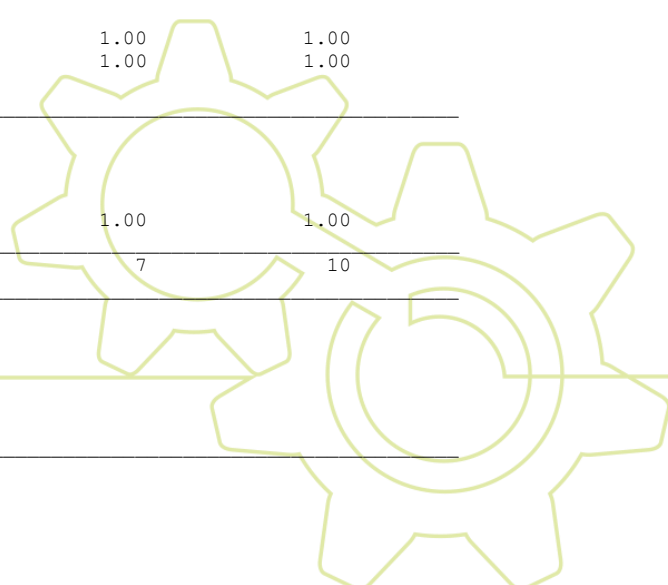
Step 4: LT from Minor St.	7	10
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Part 1 - First Stage

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	386	
Potential Capacity	600	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	598	

Results for Two-stage process:

a	
Y	
C t	598

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	6					
Movement Capacity (vph)	598					
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

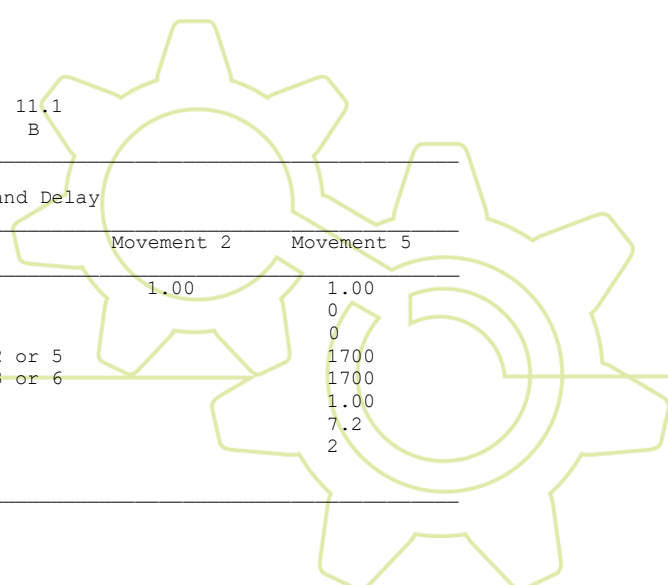
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	598					
Volume	6					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		5	6					
C (m) (vph)		1636	598					
v/c		0.00	0.01					
95% queue length		0.01	0.03					
Control Delay		7.2	11.1					
LOS		A	B					
Approach Delay				11.1				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 3		0
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.2
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		



### 1.1.1.6 Interseção E – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

#### TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: E  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2-M7+M8-M11  
 North/South Street: M11  
 Intersection Orientation: EW Study period (hrs): 1.00

		Vehicle Volumes and Adjustments						
Major Street:	Approach Movement	Eastbound				Westbound		
		1 L	2 T	3 R	4   L	5 T	6 R	
Volume					4	1966		
Peak-Hour Factor, PHF					0.91	0.91		
Hourly Flow Rate, HFR					4	2160		
Percent Heavy Vehicles		--	--		0	--	--	
Median Type/Storage		Undivided			/			
RT Channelized?								
Lanes					0	2		
Configuration						LT T		
Upstream Signal?		No				No		

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10   L	11 T	12 R
Volume		0					
Peak Hour Factor, PHF		0.91					
Hourly Flow Rate, HFR		0					
Percent Heavy Vehicles		0					
Percent Grade (%)			0			0	
Flared Approach: Exists?/Storage					/		/
Lanes		1					
Configuration		L					

		Delay, Queue Length, and Level of Service						
Approach Movement	EB 1	WB 4	Northbound			Southbound		
			7   L	8	9	10 	11	12
Lane Config		LT	L					
v (vph)		4	0					
C (m) (vph)		1636	240					
v/c		0.00	0.00					
95% queue length		0.01	0.00					
Control Delay		7.2	20.0					
LOS		A	C					
Approach Delay								
Approach LOS								

HCS+: Unsignalized Intersections Release 5.6

Phone:  
E-Mail:

Fax:

#### TWO-WAY STOP CONTROL (TWSC) ANALYSIS

Analyst: Progeplan







	L	L	L	T	R	L	T	R
V c,x s P x V c,u,x		0	1088					
C r,x C plat,x								

Two-Stage Process

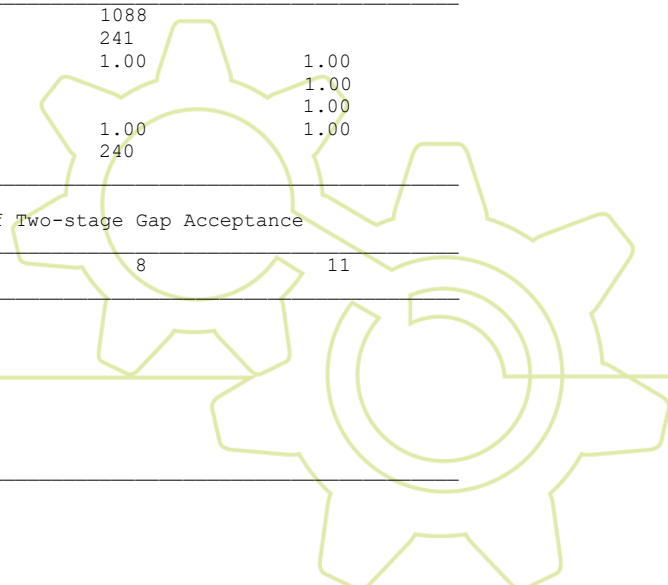
	7	8	10	11
	Stage1	Stage2	Stage1	Stage2
V(c,x) s P(x) V(c,u,x)		3000		
C(r,x) C(plat,x)				

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows	0	
Potential Capacity	1636	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1636	
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	
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	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows	1088	
Potential Capacity	241	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	240	

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	1.00	1.00
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	1088	
Potential Capacity	241	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	240	

---

Results for Two-stage process:		
a		
y		
C t	240	

Worksheet 8-Shared Lane Calculations

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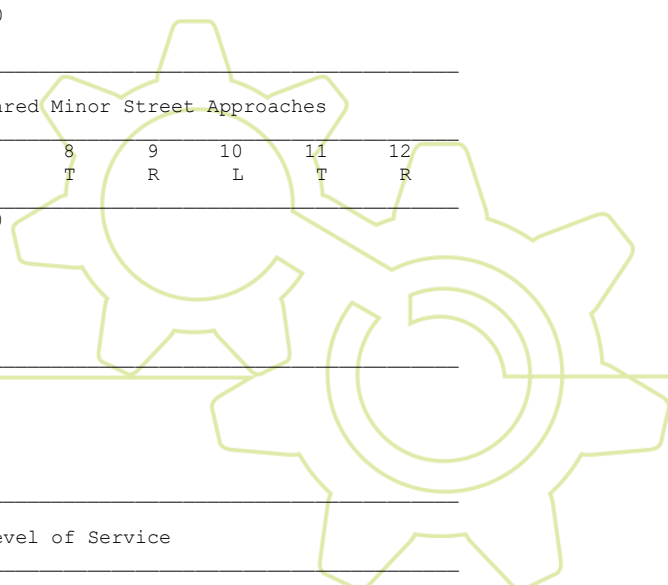
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
<hr/>						
Volume (vph)	0					
Movement Capacity (vph)	240					
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

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Movement	7	8	9	10	11	12
	L	T	R	L	T	R
<hr/>						
C sep	240					
Volume	0					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
<hr/>						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service



Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		4	0					
C(m) (vph)		1636	240					
v/c		0.00	0.00					
95% queue length		0.01	0.00					
Control Delay		7.2	20.0					
LOS		A	C					
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.2
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.7 Interseção F – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: F  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: SEM EMPREENDIMENTO  
 East/West Street: M01-M05-M07+M08+M06-M11  
 North/South Street: M12  
 Intersection Orientation: EW Study period (hrs): 1.00

Major Street: Approach		Eastbound				Westbound		
Movement		1	2	3	4	5	6	
		L	T	R	L	T	R	
Volume		9	1944					
Peak-Hour Factor, PHF		0.91	0.91					
Hourly Flow Rate, HFR		9	2136					
Percent Heavy Vehicles		12	--	--	--	--	--	
Median Type/Storage		Undivided /						
RT Channelized?								
Lanes		0	2					
Configuration		LT T						
Upstream Signal?		No						
Minor Street: Approach		Northbound			Southbound			
Movement		7	8	9	10	11	12	
		L	T	R	L	T	R	
Volume		5						
Peak Hour Factor, PHF		0.91						
Hourly Flow Rate, HFR		5						
Percent Heavy Vehicles		0						
Percent Grade (%)		0						
Flared Approach: Exists?/Storage		/						
Lanes		1						
Configuration		L						

Delay, Queue Length, and Level of Service

Approach Movement Lane Config	EB 1 LT	WB 4 	Northbound 7 8 9 	Southbound 10 11 12   L
v (vph)	9			5
C(m) (vph)	1560			241
v/c	0.01			0.02
95% queue length	0.02			0.06
Control Delay	7.3			20.3
LOS	A			C
Approach Delay				20.3
Approach LOS				C

HCS+: Unsignalized Intersections Release 5.6

Phone:  
E-Mail:

Fax:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: F  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: SEM EMPREENDIMENTO  
 East/West Street: M01-M05-M07+M08+M06-M11  
 North/South Street: M12  
 Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1		2		3		4		5		6	
	L	T	L	T	R	L	T	L	T	R		
Volume	9	1944										
Peak-Hour Factor, PHF	0.91	0.91										
Peak-15 Minute Volume	2	534										
Hourly Flow Rate, HFR	9	2136										
Percent Heavy Vehicles	12	--	--					--	--			
Median Type/Storage	Undivided					/						
RT Channelized?												
Lanes	0	2										
Configuration		LT T										
Upstream Signal?		No						No				

Minor Street Movements	7		8		9		10		11		12	
	L	T	L	T	R	L	T	L	T	R		
Volume						5						
Peak Hour Factor, PHF						0.91						
Peak-15 Minute Volume						1						
Hourly Flow Rate, HFR						5						
Percent Heavy Vehicles						0						
Percent Grade (%)		0					0					
Flared Approach: Exists?/Storage		/				/						
RT Channelized												
Lanes						1						
Configuration						L						

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0

		Upstream Signal Data					
	Prog.	Sat	Arrival	Green	Cycle	Prog.	Distance
	Flow	Flow	Type	Time	Length	Speed	to Signal
	vph	vph		sec	sec	kph	meters
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:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)	4.1					7.1		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	12					0		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		
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					6.4		
2-stage								

Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)	2.20					3.50		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	12					0		
t(f)	2.3					3.5		

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)				



Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		1086
Potential Capacity		242
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity		241

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
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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	0.99	0.99
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

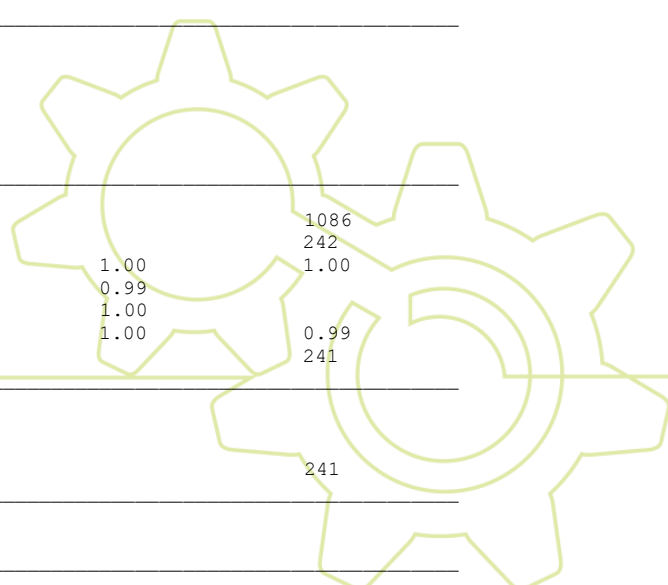
Part 2 - Second Stage  
 Conflicting Flows  
 Potential Capacity  
 Pedestrian Impedance Factor  
 Cap. Adj. factor due to Impeding mvmnt  
 Movement Capacity

Part 3 - Single Stage		
Conflicting Flows		1086
Potential Capacity		242
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity		241

Results for Two-stage process:

a		
y		
C t		241

Worksheet 8-Shared Lane Calculations





Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				5		
Movement Capacity (vph)				241		
Shared Lane Capacity (vph)						

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				241		
Volume				5		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	9					5		
C(m) (vph)	1560					241		
v/c	0.01					0.02		
95% queue length	0.02					0.06		
Control Delay	7.3					20.3		
LOS	A					C		
Approach Delay							20.3	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.3	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.8 Interseção F – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: F  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M01-M05-M07+M08+M06-M11  
 North/South Street: M12  
 Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments  
 Major Street: Approach Eastbound Westbound

Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	6	697				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	6	765				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	2				
Configuration	LT T					
Upstream Signal?	No				No	

Minor Street: Approach Movement	Northbound			Southbound		
	7 L	8 T	9 R	10 L	11 T	12 R
Volume				4		
Peak Hour Factor, PHF				0.91		
Hourly Flow Rate, HFR				4		
Percent Heavy Vehicles				0		
Percent Grade (%)	0				0	
Flared Approach: Exists?/Storage				/		/
Lanes				1		
Configuration				L		

Delay, Queue Length, and Level of Service									
Approach Movement	EB	WB	Northbound			Southbound			
	1	4	7	8	9	10	11	12	
Lane Config	LT						L		
v (vph)	6					4			
C(m) (vph)	1636					613			
v/c	0.00					0.01			
95% queue length	0.01					0.02			
Control Delay	7.2					10.9			
LOS	A					B			
Approach Delay								10.9	
Approach LOS								B	

HCS+: Unsignalized Intersections Release 5.6

Phone:  
E-Mail:

Fax:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: F  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M01-M05-M07+M08+M06-M11  
 North/South Street: M12  
 Intersection Orientation: EW  
 Study period (hrs): 1.00

Vehicle Volumes and Adjustments						
Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	6	697				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	2	191				
Hourly Flow Rate, HFR	6	765				
Percent Heavy Vehicles	0	--	--		--	--

Median Type/Storage	Undivided				/	
RT Channelized?						
Lanes	0	2				
Configuration	LT T					
Upstream Signal?	No		No			
Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				4		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				1		
Hourly Flow Rate, HFR				4		
Percent Heavy Vehicles				0		
Percent Grade (%)	0				0	
Flared Approach: Exists?/Storage			/		/	
RT Channelized						
Lanes				1		
Configuration				L		

Pedestrian Volumes and Adjustments				
Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)	4.1					7.1		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					0		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		
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					6.4		
2-stage								
Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)	2.20					3.50		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		
t(f)	2.2					3.5		

Worksheet 5-Effect of Upstream Signals

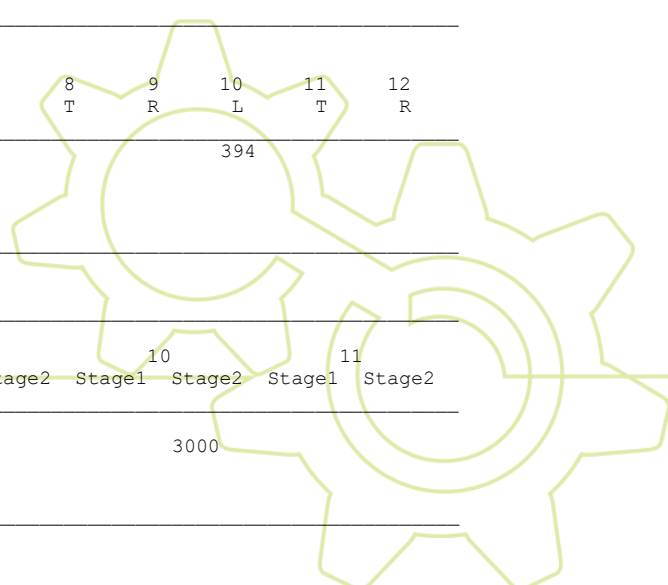
Computation 1-Queue Clearance Time at Upstream Signal				
	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				
Total Saturation Flow Rate, s (vph)				
Arrival Type				
Effective Green, g (sec)				
Cycle Length, C (sec)				
Rp (from Exhibit 16-11)				
Proportion vehicles arriving on green 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	0					394			
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)						3000			
s									
P(x)									
V(c,u,x)									
C(r,x)									
C(plat,x)									



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Worksheet 6-Impedance and Capacity Equations

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Step 1: RT from Minor St.	9	12
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Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

---

Step 2: LT from Major St.	4	1
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---

Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		1.00

---

Step 3: TH from Minor St.	8	11
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Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

---

Step 4: LT from Minor St.	7	10
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Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		

---

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

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Step 3: TH from Minor St.	8	11
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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	1.00	1.00
Movement Capacity		

---

Result for 2 stage process:

a		
Y		
C t		
Probability of Queue free St.	1.00	1.00

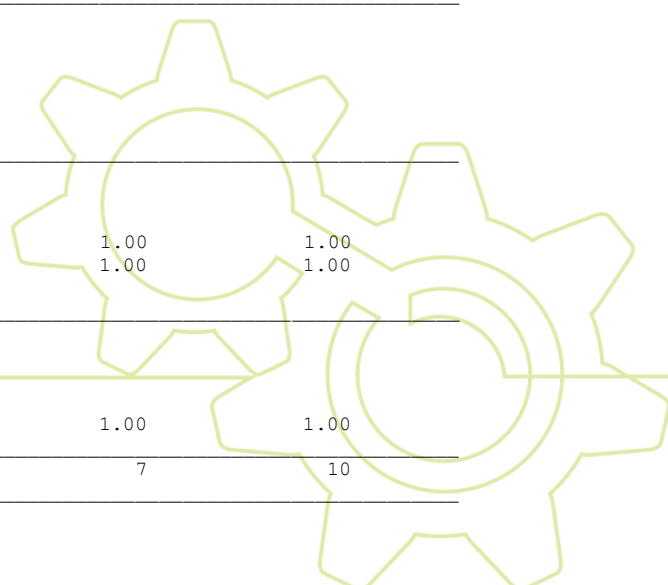
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Step 4: LT from Minor St.	7	10
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---

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		394
Potential Capacity		615
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		613

---

Results for Two-stage process:

a	
y	
C t	613

---

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				4		
Movement Capacity (vph)				613		
Shared Lane Capacity (vph)						

---

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				613		
Volume				4		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

---

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	6					4		
C(m) (vph)	1636					613		
v/c	0.00					0.01		
95% queue length	0.01					0.02		
Control Delay	7.2					10.9		
LOS	A					B		
Approach Delay							10.9	
Approach LOS							B	

---

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	

s(i2), Saturation flow rate for stream 3 or 6 1700  
P\*(oj) 1.00  
d(M,LT), Delay for stream 1 or 4 7.2  
N, Number of major street through lanes 2  
d(rank,1) Delay for stream 2 or 5

### 1.1.1.9 Interseção G – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

#### TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
Agency/Co.:  
Date Performed: 05/06/2023  
Analysis Time Period: Pico Manha  
Intersection: G  
Jurisdiction: DER/DF  
Units: U. S. Metric  
Analysis Year: 2023  
Project ID: ATUAL SEM EMPREENDIMENTO  
East/West Street: M2-M7+M8-M11+M12-M13  
North/South Street: M13  
Intersection Orientation: EW Study period (hrs): 1.00

		Vehicle Volumes and Adjustments					
Major Street:	Approach Movement	Eastbound			Westbound		
		1 L	2 T	3 R	4 L	5 T	6 R
Volume					30	688	
Peak-Hour Factor, PHF					0.91	0.91	
Hourly Flow Rate, HFR					32	756	
Percent Heavy Vehicles		--	--		4	--	--
Median Type/Storage		Undivided			/		
RT Channelized?							
Lanes					0	2	
Configuration					LT	T	
Upstream Signal?			No			No	

		Northbound			Southbound		
Minor Street:	Approach Movement	7	8	9	10	11	12
		L	T	R	L	T	R
Volume		2					
Peak Hour Factor, PHF		1.00					
Hourly Flow Rate, HFR		2					
Percent Heavy Vehicles		0					
Percent Grade (%)			0			0	
Flared Approach: Exists?/Storage					/		/
Lanes		1					
Configuration		L					

		Delay, Queue Length, and Level of Service						
Approach Movement	EB 1	WB 4	Northbound			Southbound		
			7 L	8 T	9 R	10 L	11 T	12 R
Lane Config		LT	L					
v (vph)		32	2					
C (m) (vph)		1610	566					
v/c		0.02	0.00					
95% queue length		0.06	0.01					
Control Delay		7.3	11.4					
LOS		A	B					
Approach Delay				11.4				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone:  
E-Mail:

Fax:

TWO-WAY STOP CONTROL (TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: G  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2-M7+M8-M11+M12-M13  
 North/South Street: M13  
 Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments						
Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				30	688	
Peak-Hour Factor, PHF				0.91	0.91	
Peak-15 Minute Volume				8	189	
Hourly Flow Rate, HFR				32	756	
Percent Heavy Vehicles		--	--	4	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes				0	2	
Configuration					LT T	
Upstream Signal?		No			No	
Minor Street Movements						
Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2					
Peak Hour Factor, PHF	1.00					
Peak-15 Minute Volume	0					
Hourly Flow Rate, HFR	2					
Percent Heavy Vehicles	0					
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes	1					
Configuration	L					

Pedestrian Volumes and Adjustments				
Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2



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					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		4	0					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
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	6.4					
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					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		4	0					
t(f)		2.2	3.5					

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

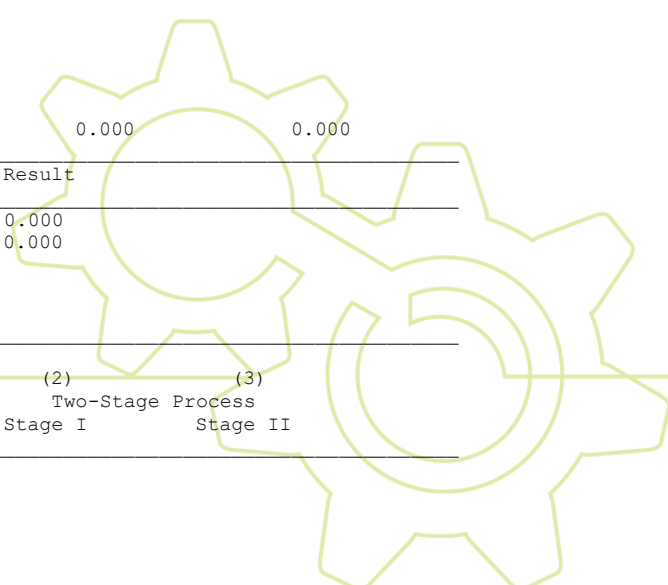
Computation 3-Platoon Event Periods

	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		0	442					
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		3000						
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

Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Movement Capacity				
Probability of Queue free St.		1.00		1.00

Step 2: LT from Major St.		4		1
---------------------------	--	---	--	---

Conflicting Flows

Potential Capacity		1610		
Pedestrian Impedance Factor		1.00		1.00
Movement Capacity		1610		
Probability of Queue free St.		0.98		1.00
Maj L-Shared Prob Q free St.		0.98		

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		0.98		0.98
Movement Capacity				
Probability of Queue free St.		1.00		1.00

Step 4: LT from Minor St.		7		10
---------------------------	--	---	--	----

Conflicting Flows

Potential Capacity		442		
Pedestrian Impedance Factor		577		
Maj. L, Min T Impedance factor		1.00		1.00
Maj. L, Min T Adj. Imp Factor.				0.98
Cap. Adj. factor due to Impeding mvmnt		0.98		0.98
Movement Capacity		566		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.		8		11
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Part 1 - First Stage

Conflicting Flows  
Potential Capacity  
Pedestrian Impedance Factor  
Cap. Adj. factor due to Impeding mvmnt



SUM C sep  
n  
C act

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		32	2					
C(m) (vph)		1610	566					
v/c		0.02	0.00					
95% queue length		0.06	0.01					
Control Delay		7.3	11.4					
LOS		A	B					
Approach Delay				11.4				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(i1), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.10 Interseção G – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: G  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2-M7+M8-M11+M12-M13  
 North/South Street: M13  
 Intersection Orientation: EW  
 Study period (hrs): 1.00

		Vehicle Volumes and Adjustments					
Major Street: Approach Movement	Eastbound			Westbound			
	1 L	2 T	3 R	4 L	5 T	6 R	
Volume				35	1969		
Peak-Hour Factor, PHF				0.91	0.91		
Hourly Flow Rate, HFR				38	2163		
Percent Heavy Vehicles		--	--	0	--	--	
Median Type/Storage	Undivided						
RT Channelized?							
Lanes	0 2						
Configuration	LT T						
Upstream Signal?	No No						
Minor Street: Approach Movement		Northbound			Southbound		
		7 L	8 T	9 R	10 L	11 T	12 R
Volume		6					
Peak Hour Factor, PHF		0.91					
Hourly Flow Rate, HFR		6					
Percent Heavy Vehicles		0					
Percent Grade (%)			0			0	

Flared Approach: Exists?/Storage / /  
Lanes 1  
Configuration L

Delay, Queue Length, and Level of Service								
Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		38	6					
C(m) (vph)		1636	214					
v/c		0.02	0.03					
95% queue length		0.07	0.09					
Control Delay		7.3	22.3					
LOS		A	C					
Approach Delay				22.3				
Approach LOS				C				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:  
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
Agency/Co.:  
Date Performed: 05/06/2023  
Analysis Time Period: Pico Tarde  
Intersection: G  
Jurisdiction: DER/DF  
Units: U. S. Metric  
Analysis Year: 2023  
Project ID: ATUAL SEM EMPREENDIMENTO  
East/West Street: M2-M7+M8-M11+M12-M13  
North/South Street: M13  
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments						
Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				35	1969	
Peak-Hour Factor, PHF				0.91	0.91	
Peak-15 Minute Volume				10	541	
Hourly Flow Rate, HFR				38	2163	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?				0	2	
Lanes				LT	T	
Configuration					No	
Upstream Signal?	No					
Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	6					
Peak Hour Factor, PHF	0.91					
Peak-15 Minute Volume	2					
Hourly Flow Rate, HFR	6					
Percent Heavy Vehicles	0					
Percent Grade (%)		0		/	0	/
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes		1				
Configuration		L				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
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	6.4					
2-stage								

Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0					
t(f)		2.2	3.5					

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)



Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10

Conflicting Flows	1157	
Potential Capacity	219	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	214	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
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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	0.98	0.98
Movement Capacity		

Result for 2 stage process:		
a		
Y		
C t		
Probability of Queue free St.	1.00	1.00

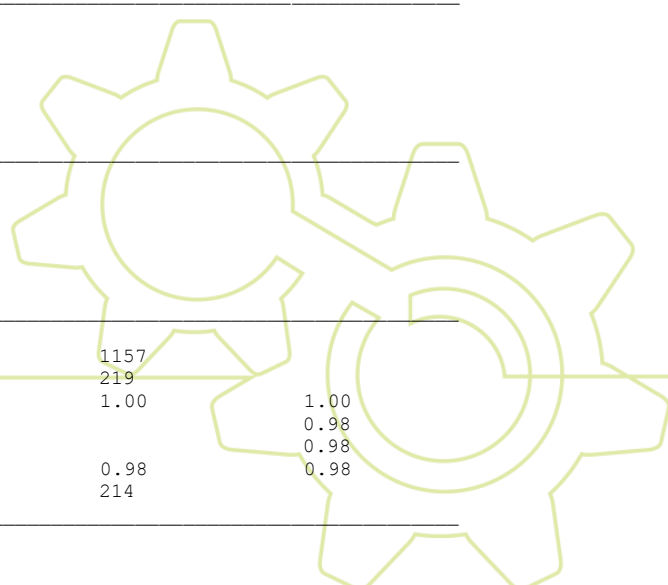
Step 4: LT from Minor St.	7	10
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Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

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	1157	
Potential Capacity	219	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	214	

Results for Two-stage process:		
a		





Y  
C t

214

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	6					
Movement Capacity (vph)	214					
Shared Lane Capacity (vph)						

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	214					
Volume	6					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		38	6					
C(m) (vph)		1636	214					
v/c		0.02	0.03					
95% queue length		0.07	0.09					
Control Delay		7.3	22.3					
LOS		A	C					
Approach Delay				22.3				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

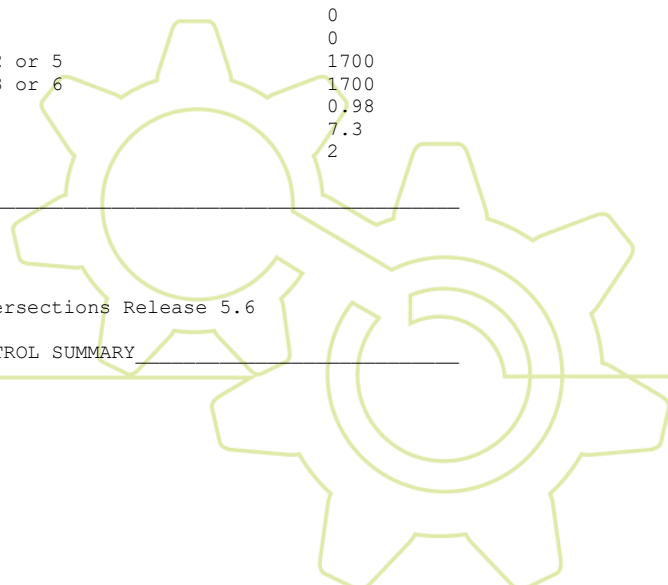
	Movement 2	Movement 5
p(oj)	1.00	0.98
v(i1), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.11 Interseção H – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: H  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO



East/West Street: M01-M05-M07+M08+M06-M11+M12  
 North/South Street: M14  
 Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments							
Major Street: Approach Movement	Eastbound				Westbound		
	1 L	2 T	3 R	4   L	5 T	6 R	
Volume	1	1769					
Peak-Hour Factor, PHF	0.91	0.91					
Hourly Flow Rate, HFR	1	1943					
Percent Heavy Vehicles	0	--	--		--	--	
Median Type/Storage RT Channelized?	Undivided				/		
Lanes	0	2					
Configuration		LT T					
Upstream Signal?		No			No		

Minor Street: Approach Movement	Northbound				Southbound		
	7 L	8 T	9 R	10   L	11 T	12 R	
Volume				30			
Peak Hour Factor, PHF				0.91			
Hourly Flow Rate, HFR				32			
Percent Heavy Vehicles				4			
Percent Grade (%)	0				0		
Flared Approach: Exists?/Storage				/			/
Lanes				1			
Configuration				L			

Approach Movement	Delay, Queue Length, and Level of Service											
	EB	WB	Northbound			Southbound						
	1	4	7	8	9	10	11	12				
Lane Config	LT						L					
v (vph)	1						32					
C(m) (vph)	1636						277					
v/c	0.00						0.12					
95% queue length	0.00						0.39					
Control Delay	7.2						19.7					
LOS	A						C					
Approach Delay										19.7		
Approach LOS										C		

HCS+: Unsignalized Intersections Release 5.6

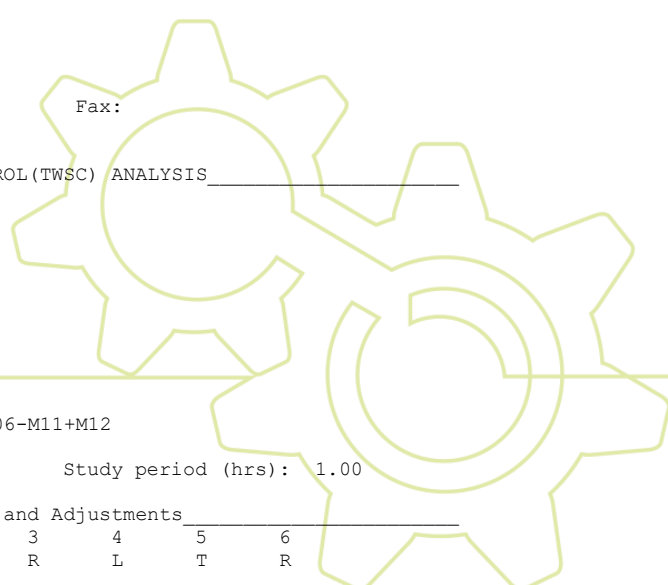
Phone:  
E-Mail:

Fax:

\_\_\_\_\_ TWO-WAY STOP CONTROL (TWSC) ANALYSIS \_\_\_\_\_

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: H  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M01-M05-M07+M08+M06-M11+M12  
 North/South Street: M14  
 Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments						
Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R





t(f,base)	2.20					3.50		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					4		
t(f)	2.2					3.5		

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) Process Stage II
--	-----------------------------	-------------------------------------	----------------------------

p(1)  
p(4)  
p(7)  
p(8)  
p(9)  
p(10)  
p(11)  
p(12)

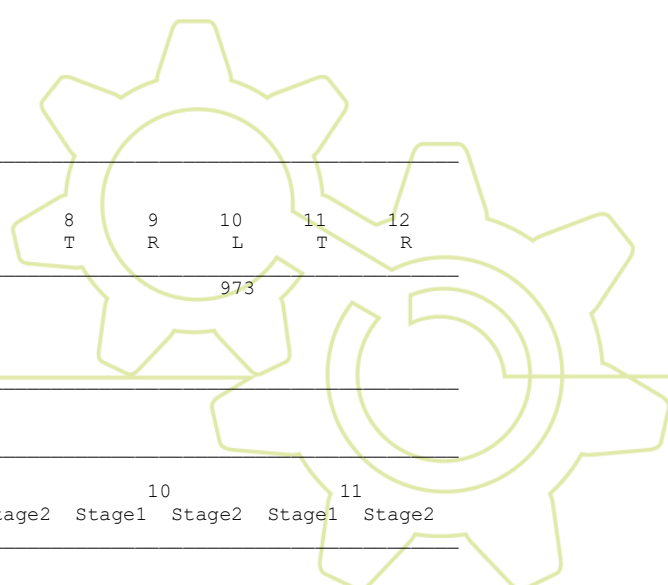
Computation 4 and 5

Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c, x	0					973		
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 3000  
P(x)  
V(C,u,x)

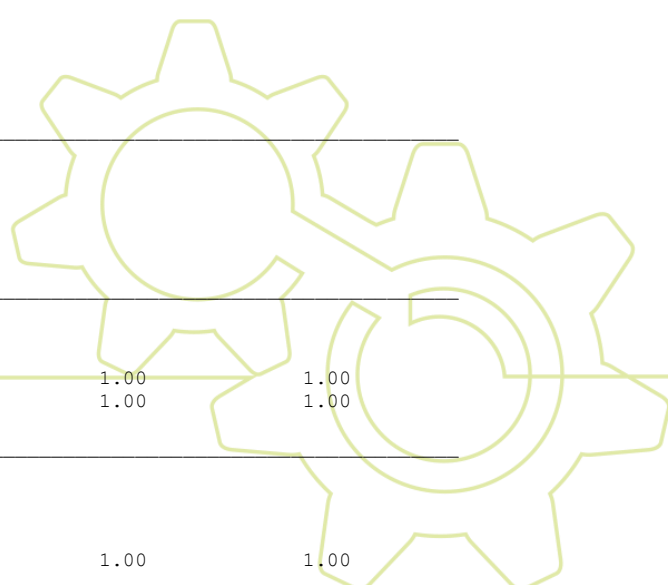
C(r,x)  
C(plat,x)

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		1.00
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	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		973
Potential Capacity		277
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		277

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	1.00	1.00
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
<b>Part 1 - First Stage</b>		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
<b>Part 2 - Second Stage</b>		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
<b>Part 3 - Single Stage</b>		
Conflicting Flows		973
Potential Capacity		277
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		277
<b>Results for Two-stage process:</b>		
a		
y		
C t		277

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				32		
Movement Capacity (vph)				277		
Shared Lane Capacity (vph)						

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				277		
Volume				32		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	1					32		
C(m) (vph)	1636					277		
v/c	0.00					0.12		
95% queue length	0.00					0.39		
Control Delay	7.2					19.7		
LOS	A					C		
Approach Delay							19.7	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	1.00	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.12 Interseção H – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

#### TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: H  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M01-M05-M07+M08+M06-M11+M12  
 North/South Street: M14  
 Intersection Orientation: EW Study period (hrs): 1.00

Major Street: Approach Movement	Vehicle Volumes and Adjustments					
	Eastbound			Westbound		
	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	6	701				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	6	770				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street: Approach Movement	Northbound			Southbound		
	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				35		
Peak Hour Factor, PHF				0.91		
Hourly Flow Rate, HFR				38		
Percent Heavy Vehicles				0		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
Lanes				1		
Configuration				L		

Approach Movement Lane Config	Delay, Queue Length, and Level of Service					
	Northbound			Southbound		
	EB	WB				
	1	4	7	8	9	10
	LT					L
v (vph)	6					38
C(m) (vph)	1636					610
v/c	0.00					0.06
95% queue length	0.01					0.20
Control Delay	7.2					11.3
LOS	A					B
Approach Delay						11.3
Approach LOS						B

HCS+: Unsignalized Intersections Release 5.6

Phone:  
E-Mail:

Fax:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: H  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M01-M05-M07+M08+M06-M11+M12  
 North/South Street: M14  
 Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	6	701				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	2	193				
Hourly Flow Rate, HFR	6	770				
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				35		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				10		
Hourly Flow Rate, HFR				38		
Percent Heavy Vehicles				0		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized						
Lanes				1		
Configuration				L		

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

Movement 2 Movement 5



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Shared ln volume, major th vehicles: 0  
 Shared ln volume, major rt vehicles: 0  
 Sat flow rate, major th vehicles: 1700  
 Sat flow rate, major rt vehicles: 1700  
 Number of major street through lanes: 2

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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		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					0		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		
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					6.4		
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		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		
t(f)	2.2					3.5		

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)

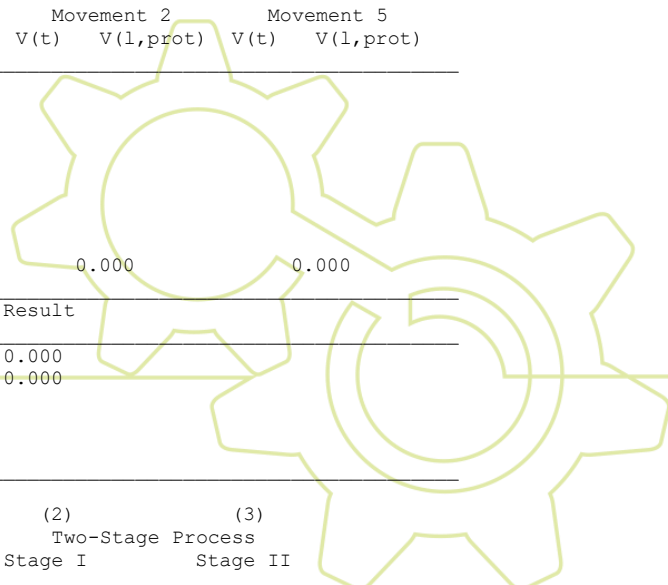
alpha  
 beta  
 Travel time, t(a) (sec)  
 Smoothing Factor, F  
 Proportion of conflicting flow, f  
 Max platooned flow, V(c,max)  
 Min platooned flow, V(c,min)  
 Duration of blocked period, t(p)  
 Proportion time blocked, p

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	0					397		
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						3000		
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		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
---------------------------	---	---

Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		1.00

Step 3: TH from Minor St.	8	11
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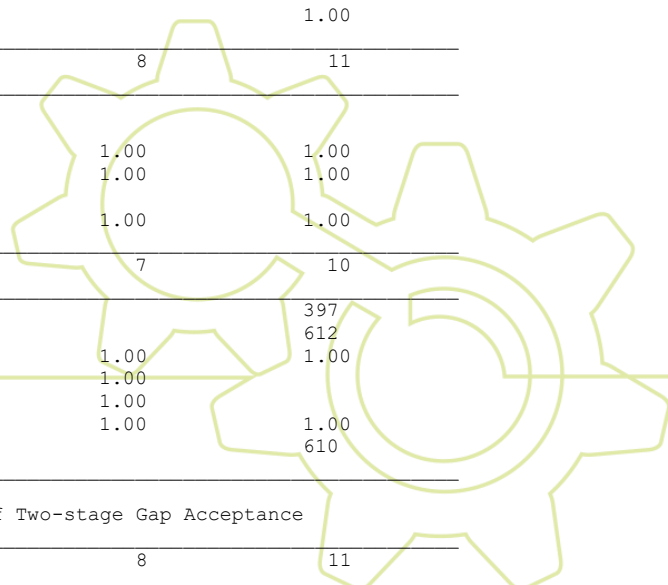
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
---------------------------	---	----

Conflicting Flows		397
Potential Capacity		612
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	1.00	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		610

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
---------------------------	---	----



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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 1.00 1.00  
 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 397  
 Potential Capacity 612  
 Pedestrian Impedance Factor 1.00 1.00  
 Maj. L, Min T Impedance factor 1.00  
 Maj. L, Min T Adj. Imp Factor. 1.00  
 Cap. Adj. factor due to Impeding mvmnt 1.00 1.00  
 Movement Capacity 610

---

Results for Two-stage process:  
 a  
 Y  
 C t 610

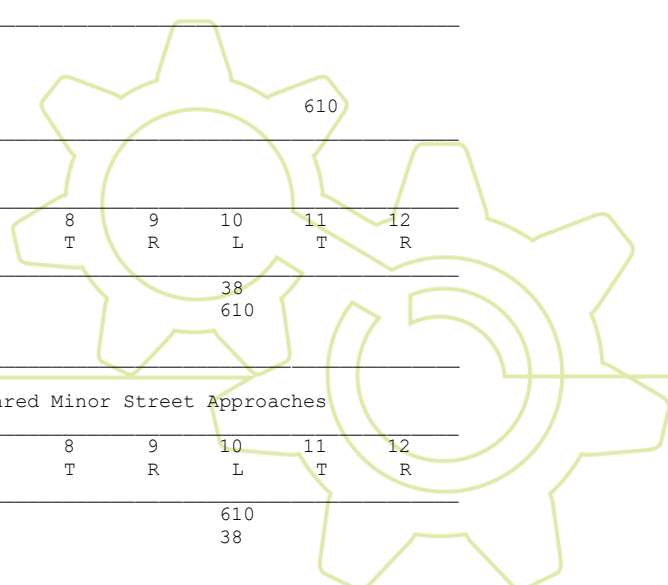
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Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				38		
Movement Capacity (vph)				610		
Shared Lane Capacity (vph)						

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				610		
Volume				38		
Delay						



Q sep  
Q sep +1  
round (Qsep +1)

n max  
C sh  
SUM C sep  
n  
C act

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	6					38		
C(m) (vph)	1636					610		
v/c	0.00					0.06		
95% queue length	0.01					0.20		
Control Delay	7.2					11.3		
LOS	A					B		
Approach Delay							11.3	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	1.00	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.13 Interseção I – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
Agency/Co.:  
Date Performed: 05/06/2023  
Analysis Time Period: Pico Manha  
Intersection: I  
Jurisdiction: DER/DF  
Units: U. S. Metric  
Analysis Year: 2023  
Project ID: ATUAL SEM EMPREENDIMENTO  
East/West Street: MOV01-MOV04-MOV10  
North/South Street: MOV10  
Intersection Orientation: EW

Study period (hrs): 1.00

Major Street: Approach	Vehicle Volumes and Adjustments					
	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	14	1780				
Peak-Hour Factor, PHF	0.91	0.91				
Hourly Flow Rate, HFR	15	1956				
Percent Heavy Vehicles	0					
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	2				
Configuration		LT T				
Upstream Signal?		No			No	

Minor Street: Approach	Vehicle Volumes and Adjustments					
	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume						
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Median Type/Storage						
RT Channelized?						
Lanes						
Configuration						
Upstream Signal?						

Volume	0
Peak Hour Factor, PHF	0.91
Hourly Flow Rate, HFR	0
Percent Heavy Vehicles	17
Percent Grade (%)	0
Flared Approach: Exists?/Storage	/
Lanes	1
Configuration	L

Delay, Queue Length, and Level of Service										
Approach	EB	WB	Northbound				Southbound			
Movement	1	4		7	8	9		10	11	12
Lane Config	LT							L		
<hr/>										
v (vph)	15							0		
C(m) (vph)	1636							248		
v/c	0.01							0.00		
95% queue length	0.03							0.00		
Control Delay	7.2							19.5		
LOS	A							C		
Approach Delay										
Approach LOS										

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:  
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: I  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: MOV01-MOV04-MOV10  
 North/South Street: MOV10  
 Intersection Orientation: EW Study period (hrs): 1.00

Major Street Movements	Vehicle Volumes and Adjustments					
	1 L	2 T	3 R	4 L	5 T	6 R
Volume	14	1780				
Peak-Hour Factor, PHF	0.91	0.91				
Peak-15 Minute Volume	4	489				
Hourly Flow Rate, HFR	15	1956				
Percent Heavy Vehicles	0	--	--	--	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	2				
Configuration	LT	T				
Upstream Signal?	No					
<hr/>						
Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				0		
Peak Hour Factor, PHF				0.91		
Peak-15 Minute Volume				0		
Hourly Flow Rate, HFR				0		
Percent Heavy Vehicles				17		
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/

RT Channelized  
Lanes 1  
Configuration L

Pedestrian Volumes and Adjustments				
Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

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		
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					17		
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		
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					6.6		
	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		
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					17		
t(f)	2.2					3.7		

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)				







Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		248

Results for Two-stage process:

a	
Y	
C t	248

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				0		
Movement Capacity (vph)				248		
Shared Lane Capacity (vph)						

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				248		
Volume				0		
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		
v (vph)	15					0		
C(m) (vph)	1636					248		
v/c	0.01					0.00		
95% queue length	0.03					0.00		
Control Delay	7.2					19.5		
LOS	A					C		
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.14 Interseção I – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
Agency/Co.:

Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: I  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: MOV01-MOV04-MOV10  
 North/South Street: MOV10  
 Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments							
Major Street:	Approach Movement	Eastbound				Westbound	
		1 L	2 T	3 R	4   L	5 T	6 R
Volume		6	707				
Peak-Hour Factor, PHF		0.91	0.91				
Hourly Flow Rate, HFR		6	776				
Percent Heavy Vehicles		0	--	--		--	--
Median Type/Storage		Undivided		/			
RT Channelized?							
Lanes		0	2				
Configuration		LT T					
Upstream Signal?		No				No	

Minor Street:	Approach Movement	Northbound			Southbound		
		7 L	8 T	9 R	10   L	11 T	12 R
Volume					10		
Peak Hour Factor, PHF					0.91		
Hourly Flow Rate, HFR					10		
Percent Heavy Vehicles					6		
Percent Grade (%)		0				0	
Flared Approach: Exists?/Storage				/		/	
Lanes					1		
Configuration					L		

Delay, Queue Length, and Level of Service								
Approach Movement	EB		Northbound			Southbound		
	1	4	7	8	9	10	11	12
Lane Config	LT						L	
v (vph)	6					10		
C(m) (vph)	1636					596		
v/c	0.00					0.02		
95% queue length	0.01					0.05		
Control Delay	7.2					11.1		
LOS	A					B		
Approach Delay						11.1		
Approach LOS						B		

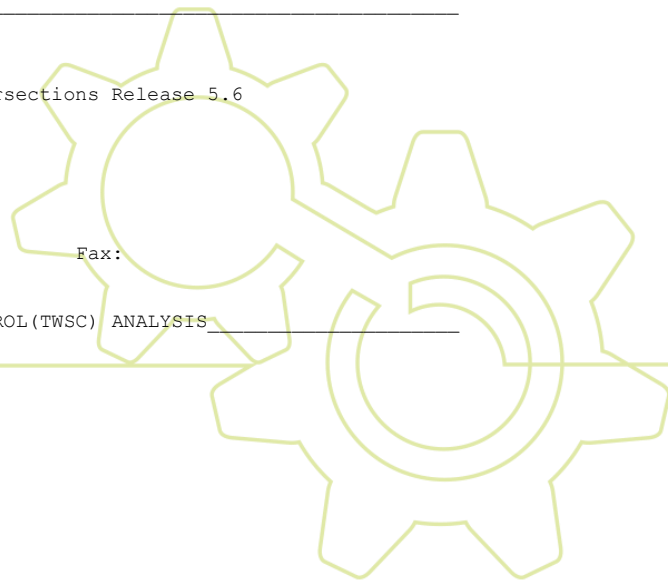
HCS+: Unsignalized Intersections Release 5.6

Phone:  
E-Mail:

Fax:

TWO-WAY STOP CONTROL (TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: I  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO





t (c)	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
	1-stage	4.1					6.5		
	2-stage								

Follow-Up Time Calculations

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t (f,base)	2.20					3.50		
t (f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P (HV)	0					6		
t (f)	2.2					3.6		

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?

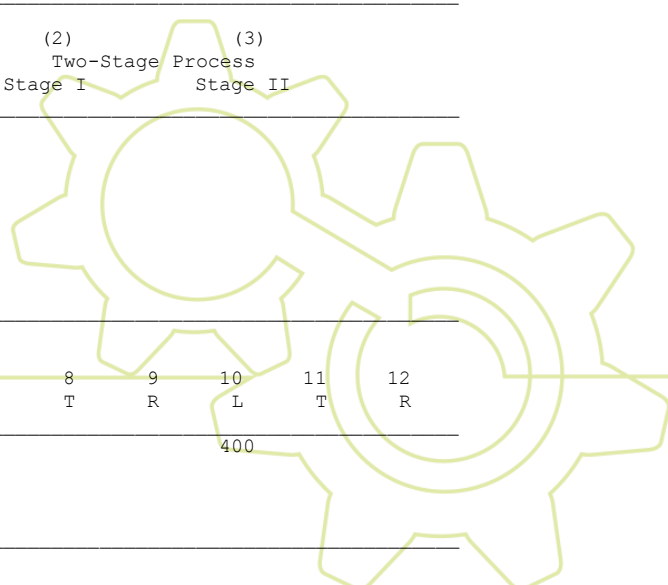
Proportion unblocked for minor movements, p(x)

	(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	0						400		
s									
Px									
V c, u, x									
C r, x									



C plat,x

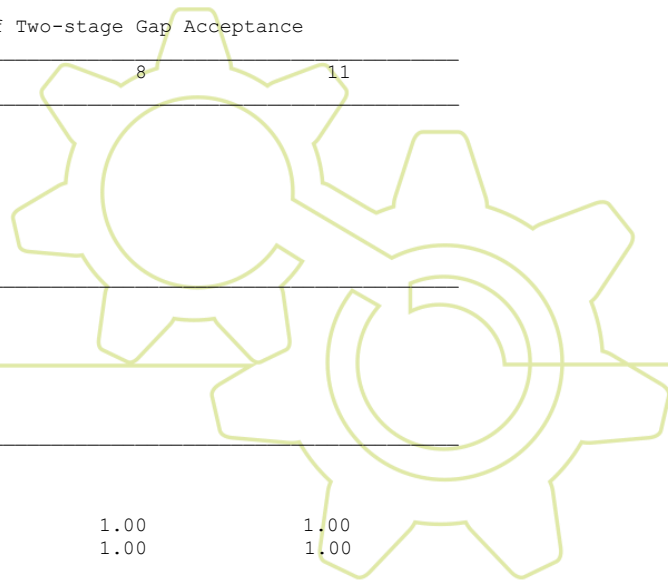
Two-Stage Process		7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	
V(c,x)									
s						3000			
P(x)									
V(c,u,x)									
C(r,x)									
C(plat,x)									

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.						9		12
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor						1.00		1.00
Movement Capacity								
Probability of Queue free St.						1.00		1.00
Step 2: LT from Major St.						4		1
Conflicting Flows								0
Potential Capacity								1636
Pedestrian Impedance Factor						1.00		1.00
Movement Capacity								1636
Probability of Queue free St.						1.00		1.00
Maj L-Shared Prob Q free St.								1.00
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						1.00		1.00
Movement Capacity								
Probability of Queue free St.						1.00		1.00
Step 4: LT from Minor St.						7		10
Conflicting Flows								400
Potential Capacity								598
Pedestrian Impedance Factor						1.00		1.00
Maj. L, Min T Impedance factor						1.00		
Maj. L, Min T Adj. Imp Factor.						1.00		
Cap. Adj. factor due to Impeding mvmnt						1.00		1.00
Movement Capacity								596

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						1.00		1.00



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 400

Potential Capacity 598

Pedestrian Impedance Factor 1.00 1.00

Maj. L, Min T Impedance factor 1.00

Maj. L, Min T Adj. Imp Factor. 1.00

Cap. Adj. factor due to Impeding mvmnt 1.00 1.00

Movement Capacity 596

Results for Two-stage process:

a

y

C t

596

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R

Volume (vph)	10					
Movement Capacity (vph)	596					
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

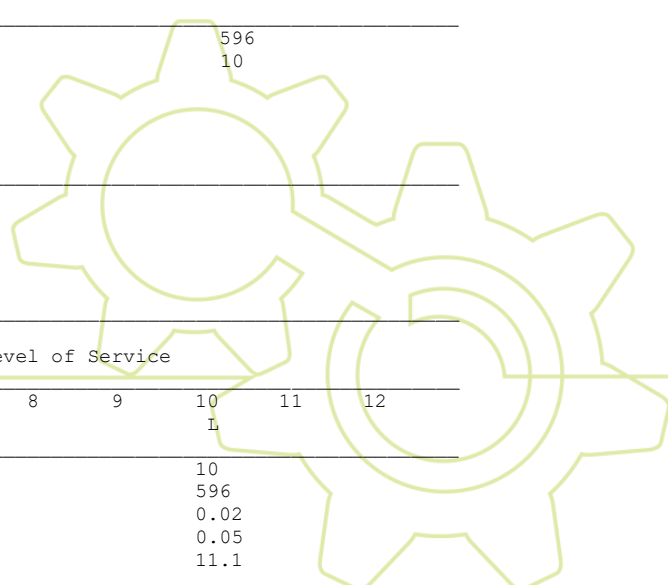
Movement	7	8	9	10	11	12
	L	T	R	L	T	R

C sep	596					
Volume	10					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12	
Lane Config	LT					L			
v (vph)	6						10		
C (m) (vph)	1636						596		
v/c	0.00						0.02		
95% queue length	0.01						0.05		
Control Delay	7.2						11.1		



LOS	A	B	11.1
Approach Delay			B
Approach LOS			

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	1.00	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.15 Interseção J – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Manha  
 Intersection: J  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2-M10  
 North/South Street: M9  
 Intersection Orientation: EW Study period (hrs): 1.00

Major Street: Approach		Vehicle Volumes and Adjustments					
Movement		Eastbound			Westbound		
		1	2	3	4	5	6
		L	T	R	L	T	R
Volume					0	751	
Peak-Hour Factor, PHF					0.91	0.91	
Hourly Flow Rate, HFR					0	825	
Percent Heavy Vehicles		--	--		17	--	--
Median Type/Storage		Undivided			/		
RT Channelized?							
Lanes					0	2	
Configuration					LT	T	
Upstream Signal?		No				No	

Minor Street: Approach		Northbound				Southbound			
Movement		7	8	9	10	11	12		
		L	T	R	L	T	R		
Volume		14							
Peak Hour Factor, PHF		1.00							
Hourly Flow Rate, HFR		14							
Percent Heavy Vehicles		0							
Percent Grade (%)		0				0			
Flared Approach: Exists?/Storage					/		/		
Lanes		1							
Configuration		L							

Approach		Delay, Queue Length, and Level of Service							
Movement		Northbound				Southbound			
Lane Config		EB	WB					WB	EB
		1	4	7	8	9	10	11	12
		LT	L						
v (vph)		0	14						
C(m) (vph)		1530	600						
v/c		0.00	0.02						
95% queue length		0.00	0.07						
Control Delay		7.4	11.1						





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:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		17	0					
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
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		4.3	6.4					
2-stage								

Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		17	0					
t(f)		2.4	3.5					

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
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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 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
--	--------	--------	--------	--------	--------	---------	---------	---------

V c,x  
s  
Px  
V c,u,x

C r,x  
C plat,x

Two-Stage Process

	7 Stage1 Stage2		8 Stage1 Stage2		10 Stage1 Stage2		11 Stage1 Stage2	
--	--------------------	--	--------------------	--	---------------------	--	---------------------	--

V(c,x)  
s  
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  
Potential Capacity  
Pedestrian Impedance Factor 1.00                      1.00  
Movement Capacity  
Probability of Queue free St. 1.00                      1.00

Step 2: LT from Major St. 4                                      1

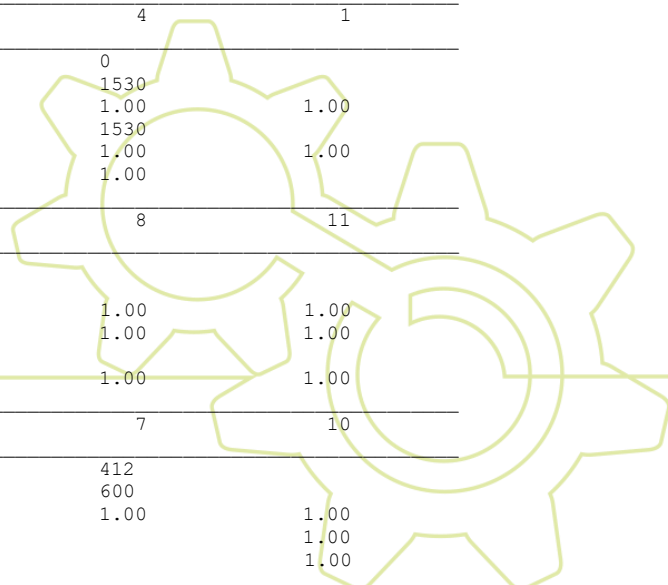
Conflicting Flows 0  
Potential Capacity 1530  
Pedestrian Impedance Factor 1.00                      1.00  
Movement Capacity 1530  
Probability of Queue free St. 1.00                      1.00  
Maj L-Shared Prob Q free St. 1.00

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 1.00                      1.00  
Movement Capacity  
Probability of Queue free St. 1.00                      1.00

Step 4: LT from Minor St. 7                                      10

Conflicting Flows 412  
Potential Capacity 600  
Pedestrian Impedance Factor 1.00                      1.00  
Maj. L, Min T Impedance factor 1.00  
Maj. L, Min T Adj. Imp Factor. 1.00



Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	600	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
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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	1.00	1.00
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
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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	412	
Potential Capacity	600	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	600	

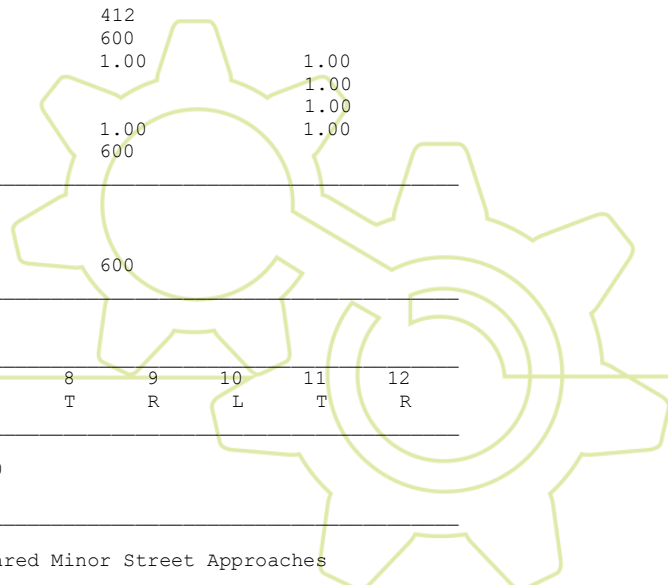
Results for Two-stage process:  
 a  
 y  
 C t

	600	
--	-----	--

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	14					
Movement Capacity (vph)	600					
Shared Lane Capacity (vph)						

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	600					
Volume	14					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		0	14					
C(m) (vph)		1530	600					
v/c		0.00	0.02					
95% queue length		0.00	0.07					
Control Delay		7.4	11.1					
LOS		A	B					
Approach Delay				11.1				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5	0	0
v(i2), Volume for stream 3 or 6	0	0
s(i1), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	1.00
d(M,LT), Delay for stream 1 or 4	7.4	7.4
N, Number of major street through lanes	2	2
d(rank,1) Delay for stream 2 or 5		

### 1.1.1.16 Interseção J – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: J  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2-M10  
 North/South Street: M9  
 Intersection Orientation: EW

Study period (hrs): 1.00

Major Street: Approach	Vehicle Volumes and Adjustments					
	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume				10	1984	
Peak-Hour Factor, PHF				0.91	0.91	
Hourly Flow Rate, HFR				10	2180	
Percent Heavy Vehicles		--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						

Lanes Configuration					0	2	
Upstream Signal?	No				LT	T	
Minor Street: Approach	Northbound			Southbound			
Movement	7	8	9		10	11	
	L	T	R		L	T	
Volume	6				0		
Peak Hour Factor, PHF	0.91				0		
Hourly Flow Rate, HFR	6				0		
Percent Heavy Vehicles	0				0		
Percent Grade (%)	0				0		
Flared Approach: Exists?/Storage Lanes	1			/	/		
Configuration	L						

Delay, Queue Length, and Level of Service										
Approach	EB	WB	Northbound				Southbound			
Movement	1	4		7	8	9		10	11	12
Lane Config	LT		L							
v (vph)	10		6							
C(m) (vph)	1597		233							
v/c	0.01		0.03							
95% queue length	0.02		0.08							
Control Delay	7.3		20.9							
LOS	A		C							
Approach Delay					20.9					
Approach LOS					C					

HCS+: Unsignalized Intersections Release 5.6

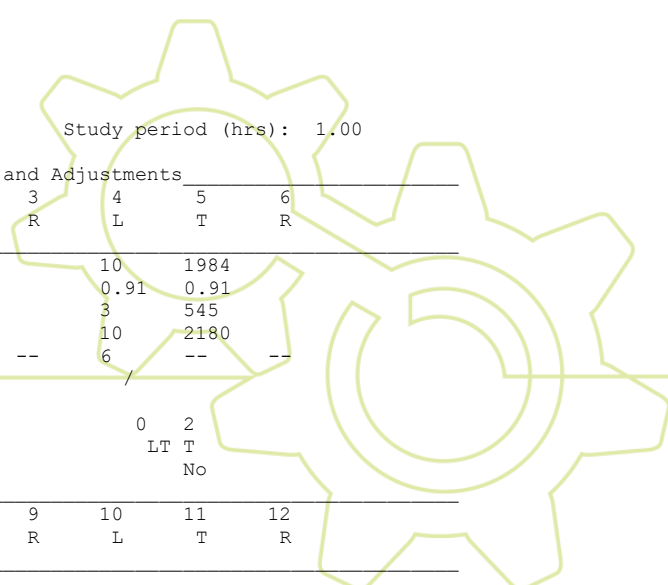
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TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: J  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: ATUAL SEM EMPREENDIMENTO  
 East/West Street: M2-M10  
 North/South Street: M9  
 Intersection Orientation: EW

Study period (hrs): 1.00

Major Street Movements	Vehicle Volumes and Adjustments					
	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10		1984			
Peak-Hour Factor, PHF	0.91		0.91			
Peak-15 Minute Volume	3		545			
Hourly Flow Rate, HFR	10		2180			
Percent Heavy Vehicles	--		--		--	
Median Type/Storage	Undivided					
RT Channelized?						
Lanes Configuration			0		2	
Upstream Signal?	No		LT		T	
Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R



Volume 6  
 Peak Hour Factor, PHF 0.91  
 Peak-15 Minute Volume 2  
 Hourly Flow Rate, HFR 6  
 Percent Heavy Vehicles 0  
 Percent Grade (%) 0 / 0  
 Flared Approach: Exists?/Storage /  
 RT Channelized  
 Lanes 1  
 Configuration L

Pedestrian Volumes and Adjustments				
Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		2

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)		4.1	7.1					
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		6						
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70					
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	6.4					
2-stage								

Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)		2.20	3.50					
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		6	0					
t(f)		2.3	3.5					

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal				
	Movement 2		Movement 5	
V prog	V(t)	V(l,prot)	V(t)	V(l,prot)
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 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
----------	--------	--------	--------	--------	--------	---------	---------	---------

V c, x		0	1110					
--------	--	---	------	--	--	--	--	--

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	3000							

P(x)  
V(c, u, x)

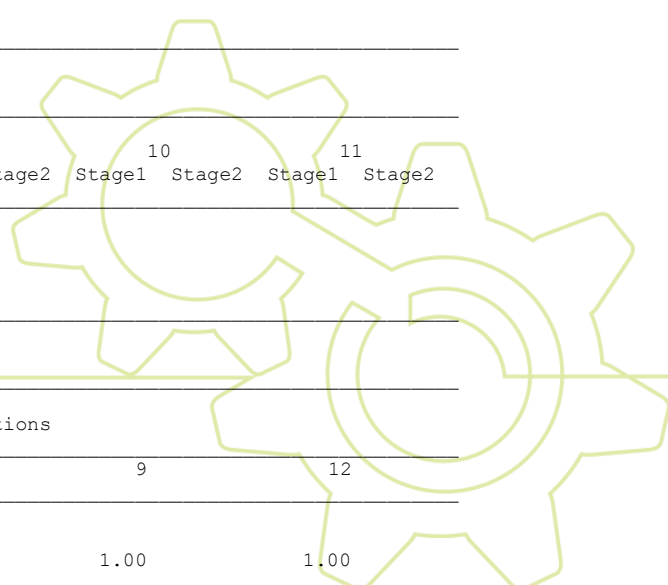
C(r, x)  
C(plat, x)

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
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Conflicting Flows

Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00



Movement Capacity		
Probability of Queue free St.	1.00	1.00

---

Step 2: LT from Major St.	4	1
---------------------------	---	---

Conflicting Flows	0	
Potential Capacity	1597	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1597	
Probability of Queue free St.	0.99	1.00
Maj L-Shared Prob Q free St.	0.99	

---

Step 3: TH from Minor St.	8	11
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Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00

---

Step 4: LT from Minor St.	7	10
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Conflicting Flows	1110	
Potential Capacity	234	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity	233	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

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Step 3: TH from Minor St.	8	11
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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	0.99	0.99
Movement Capacity		

Result for 2 stage process:

a		
y		
C t		
Probability of Queue free St.	1.00	1.00

---

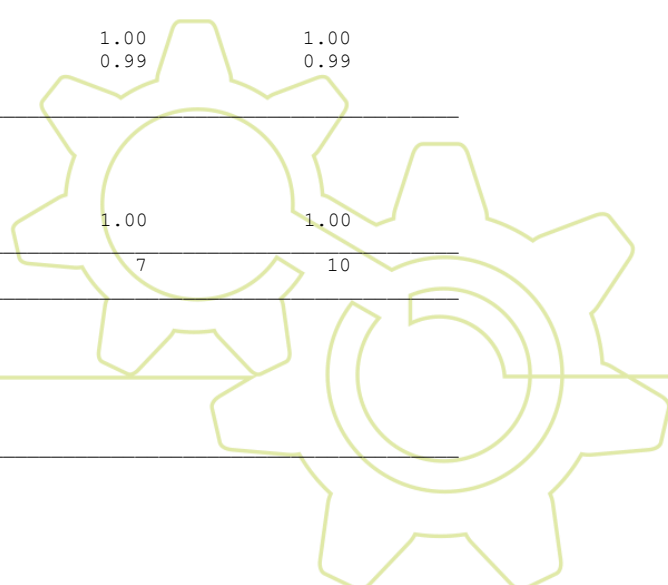
Step 4: LT from Minor St.	7	10
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Part 1 - First Stage

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	1110	
Potential Capacity	234	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity	233	

Results for Two-stage process:

a	
Y	
C t	233

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	6					
Movement Capacity (vph)	233					
Shared Lane Capacity (vph)						

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	233					
Volume	6					
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L					
v (vph)		10	6					
C (m) (vph)		1597	233					
v/c		0.01	0.03					
95% queue length		0.02	0.08					
Control Delay		7.3	20.9					
LOS		A	C					
Approach Delay				20.9				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(i1), Volume for stream 2 or 3		0
v(i2), Volume for stream 3 or 6		0
s(i1), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		7.3
N, Number of major street through lanes		2
d(rank,1) Delay for stream 2 or 5		

## 1.1.2 Memória de cálculo da análise de capacidade e níveis de serviço – Cenário ATUAL 2023 com o empreendimento sem ampliação do empreendimento

### 1.1.2.1 Interseção A – Pico Manhã

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY										
Analyst:	Progeplan									
Agency/Co.:										
Date Performed:	05/06/2023									
Analysis Time Period:	Pico Manha									
Intersection:	A									
Jurisdiction:	DER/DF									
Units: U. S. Metric										
Analysis Year:	2023									
Project ID:										
East/West Street:	MOV01-MOV04									
North/South Street:	MOV04									
Intersection Orientation: EW	Study period (hrs): 0.25									
Vehicle Volumes and Adjustments										
Major Street:	Approach Movement	Eastbound				Westbound				
		1	2	3	4	5	6			
		L	T	R	L	T	R			
Volume			1813	22						
Peak-Hour Factor, PHF			0.91	1.00						
Hourly Flow Rate, HFR			1992	22						
Percent Heavy Vehicles			--	--		--	--			
Median Type/Storage		Undivided				/				
RT Channelized?										
Lanes			2	0						
Configuration			T	TR						
Upstream Signal?			No			No				
Minor Street:	Approach Movement	Northbound				Southbound				
		7	8	9	10	11	12			
		L	T	R	L	T	R			
Volume				26						
Peak Hour Factor, PHF				0.91						
Hourly Flow Rate, HFR				28						
Percent Heavy Vehicles				0						
Percent Grade (%)		0				0				
Flared Approach: Exists?/Storage						/				
Lanes				1						
Configuration				R						
Delay, Queue Length, and Level of Service										
Approach Movement	EB	WB	Northbound				Southbound			
	1	4	7	8	9	10	11	12		
Lane Config					R					
v (vph)					28					
C(m) (vph)					295					
v/c					0.09					
95% queue length					0.31					
Control Delay					18.5					
LOS					C					
Approach Delay				18.5						
Approach LOS				C						

HCS+: Unsignalized Intersections Release 5.6

Phone:  
E-Mail:

Fax:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
Agency/Co.:  
Date Performed: 05/06/2023  
Analysis Time Period: Pico Manha  
Intersection: A  
Jurisdiction: DER/DF  
Units: U. S. Metric  
Analysis Year: 2023  
Project ID:  
East/West Street: MOV01-MOV04  
North/South Street: MOV04  
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		1813	22			
Peak-Hour Factor, PHF		0.91	1.00			
Peak-15 Minute Volume		498	6			
Hourly Flow Rate, HFR		1992	22			
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		2	0			
Configuration		T	TR			
Upstream Signal?		No			No	
Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume			26			
Peak Hour Factor, PHF			0.91			
Peak-15 Minute Volume			7			
Hourly Flow Rate, HFR			28			
Percent Heavy Vehicles			0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?			No			
Lanes			1			
Configuration			R			

Pedestrian Volumes and Adjustments				
Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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)					6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)					0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)					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					6.2			
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)					3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)					0			
t(f)					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

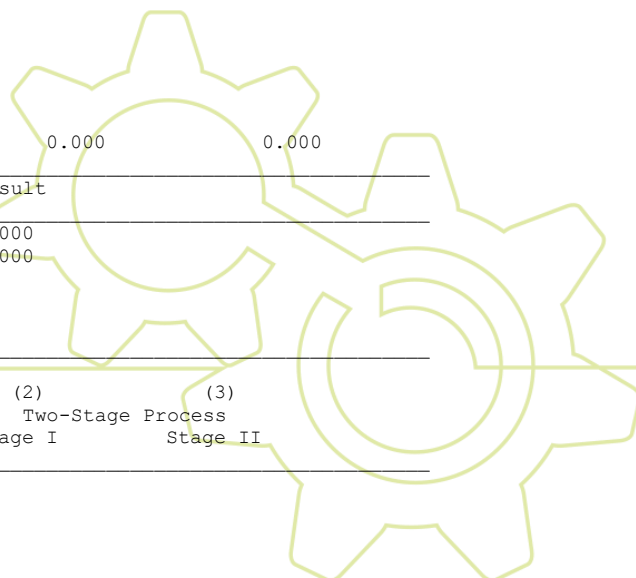
Computation 3-Platoon Event Periods

	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)





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 1.00 1.00  
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  
Potential Capacity  
Pedestrian Impedance Factor 1.00 1.00  
Maj. L, Min T Impedance factor 1.00  
Maj. L, Min T Adj. Imp Factor. 1.00  
Cap. Adj. factor due to Impeding mvmnt 1.00 0.91  
Movement Capacity

---

Results for Two-stage process:  
a  
Y  
C t

---

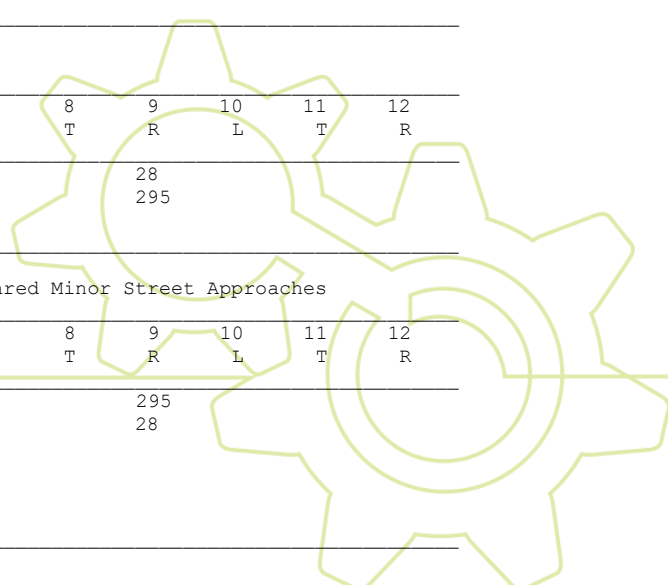
Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)			28			
Movement Capacity (vph)			295			
Shared Lane Capacity (vph)						

---

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			295			
Volume			28			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						



C sh  
SUM C sep  
n  
C act

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config					R			
v (vph)					28			
C(m) (vph)					295			
v/c					0.09			
95% queue length					0.31			
Control Delay					18.5			
LOS					C			
Approach Delay				18.5				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
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		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

### 1.1.2.2 Interseção A – Pico Tarde

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
Agency/Co.:  
Date Performed: 05/06/2023  
Analysis Time Period: Pico Tarde  
Intersection: A  
Jurisdiction: DER/DF  
Units: U. S. Metric  
Analysis Year: 2023  
Project ID: AMPLIAÇÃO EDIFÍCIO  
East/West Street: MOV01-MOV04  
North/South Street: MOV04  
Intersection Orientation: EW

Study period (hrs): 0.25

Major Street: Approach		Vehicle Volumes and Adjustments					
		Eastbound			Westbound		
Movement		1	2	3	4	5	6
		L	T	R	L	T	R
Volume			726	8			
Peak-Hour Factor, PHF			0.91	0.91			
Hourly Flow Rate, HFR			797	8			
Percent Heavy Vehicles			--	--		--	--
Median Type/Storage			Undivided		/		
RT Channelized?							
Lanes			2	0			
Configuration			T	TR			
Upstream Signal?			No		No		
Minor Street: Approach		Northbound			Southbound		
Movement		7	8	9	10	11	12
		L	T	R	L	T	R
Volume				12			

Peak Hour Factor, PHF 0.91  
 Hourly Flow Rate, HFR 13  
 Percent Heavy Vehicles 0  
 Percent Grade (%) 0 / 0 /  
 Flared Approach: Exists?/Storage  
 Lanes 1  
 Configuration R

Delay, Queue Length, and Level of Service												
Approach	EB			WB			Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12				
Lane Config					R							
v (vph)							13					
C(m) (vph)							653					
v/c							0.02					
95% queue length							0.06					
Control Delay							10.6					
LOS							B					
Approach Delay				10.6								
Approach LOS				B								

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:  
 E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Progeplan  
 Agency/Co.:  
 Date Performed: 05/06/2023  
 Analysis Time Period: Pico Tarde  
 Intersection: A  
 Jurisdiction: DER/DF  
 Units: U. S. Metric  
 Analysis Year: 2023  
 Project ID: AMPLIAÇÃO EDIFÍCIO  
 East/West Street: MOV01-MOV04  
 North/South Street: MOV04  
 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		726	8			
Peak-Hour Factor, PHF		0.91	0.91			
Peak-15 Minute Volume		199	2			
Hourly Flow Rate, HFR		797	8			
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?				No		
Lanes		2	0			
Configuration		T	TR			
Upstream Signal?		No				
Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume			12			
Peak Hour Factor, PHF			0.91			
Peak-15 Minute Volume			3			
Hourly Flow Rate, HFR			13			
Percent Heavy Vehicles			0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized			No			
Lanes			1			



Configuration R

Movements	Pedestrian Volumes and Adjustments			
	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (m)	3.6	3.6	3.6	3.6
Walking Speed (m/sec)	1.2	1.2	1.2	1.2
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 kph	Distance to Signal meters
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	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)					6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)					0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)					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					6.2			
2-stage								

Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)					3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)					0			
t(f)					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) 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                      402  
s  
Px  
V c,u,x

---

C r,x  
C plat,x

---

Two-Stage Process

	7	8	10	11
	Stage1	Stage2	Stage1	Stage2

---

V(c,x)  
s  
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

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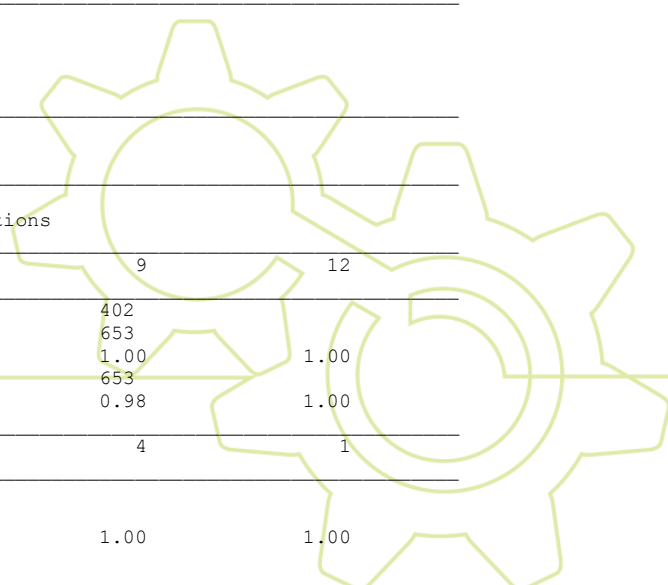
Conflicting Flows	402	
Potential Capacity	653	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	653	
Probability of Queue free St.	0.98	1.00

---

Step 2: LT from Major St.                      4                      1

---

Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		



Probability of Queue free St.	1.00	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	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00

---

Step 4: LT from Minor St.	7	10
---------------------------	---	----

---

Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.98
Movement Capacity		

---

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	1.00	1.00
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
---------------------------	---	----

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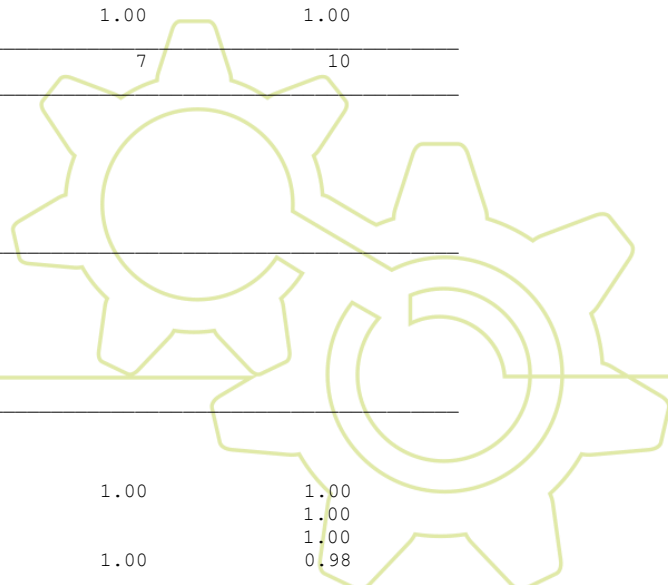
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

---

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		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.98



Movement Capacity

Results for Two-stage process:

a  
Y  
C t

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R

Volume (vph) 13  
 Movement Capacity (vph) 653  
 Shared Lane Capacity (vph)

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 653  
 Volume 13  
 Delay  
 Q sep  
 Q sep +1  
 round (Qsep +1)

n max  
 C sh  
 SUM C sep  
 n  
 C act

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config					R			

v (vph) 13  
 C(m) (vph) 653  
 v/c 0.02  
 95% queue length 0.06  
 Control Delay 10.6  
 LOS B  
 Approach Delay 10.6  
 Approach LOS B

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
--	------------	------------

p(oj) 1.00 1.00  
 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  
 N, Number of major street through lanes  
 d(rank,1) Delay for stream 2 or 5

**1.1.2.3 Interseção B – Pico Manhã**

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Progeplan  
 Agency/Co.:

