HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway and Pine
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (SR 426)
North/South Street: Pine Avenue
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	164	722			485	143
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	182	802			538	158
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						No
Lanes	1	1			1	1
Configuration	L	T			T	R
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				104		137
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				115		152
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L					L		R
v (vph)	182					115		152
C(m) (vph)	909					82		547
v/c	0.20					1.40		0.28
95% queue length	0.74					8.95		1.13
Control Delay	9.9					328.9		14.1
LOS	A					F		B
Approach Delay							149.7	
Approach LOS							F	

HCS2000: Unsignalized Intersections Release 4.1d

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TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway and Pine
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (SR 426)
North/South Street: Pine Avenue
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	164	722			485	143
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Peak-15 Minute Volume	46	201			135	40
Hourly Flow Rate, HFR	182	802			538	158
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						No
Lanes	1	1			1	1
Configuration	L	T			T	R
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				104		137
Peak Hour Factor, PHF				0.90		0.90
Peak-15 Minute Volume				29		38
Hourly Flow Rate, HFR				115		152
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						No
Lanes				1		1
Configuration				L		R

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.4		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)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) 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	696					1704		538
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							538	
Potential Capacity							547	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							547	
Probability of Queue free St.					1.00		0.72	
Step 2: LT from Major St.					4		1	
Conflicting Flows							696	
Potential Capacity							909	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							909	
Probability of Queue free St.					1.00		0.80	
Maj L-Shared Prob Q free St.								
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.80		0.80	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							1704	
Potential Capacity							102	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.80			
Maj. L, Min T Adj. Imp Factor.					0.85			
Cap. Adj. factor due to Impeding mvmnt					0.61		0.80	
Movement Capacity							82	

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	0.80	0.80
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		1704
Potential Capacity		102
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.80	
Maj. L, Min T Adj. Imp Factor.	0.85	
Cap. Adj. factor due to Impeding mvmnt	0.61	0.80
Movement Capacity		82
Results for Two-stage process:		
a		
y		
C t		82

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				115		152
Movement Capacity (vph)				82		547
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				82		547
Volume				115		152
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	L					L		R
v (vph)	182					115		152
C(m) (vph)	909					82		547
v/c	0.20					1.40		0.28
95% queue length	0.74					8.95		1.13
Control Delay	9.9					328.9		14.1
LOS	A					F		B
Approach Delay							149.7	
Approach LOS							F	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.80	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), 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	9.9	
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

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TWO-WAY STOP CONTROL SUMMARY

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (SR 426) and Aulin Av
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (SR 426)
North/South Street: Aulin Avenue
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	95	675	16	12	483	50
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	105	750	17	13	536	55
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?						No
Lanes	1	1	0	1	1	1
Configuration	L	TR		L	T	R
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15		39	64		48
Peak Hour Factor, PHF	0.90		0.90	0.90		0.90
Hourly Flow Rate, HFR	16		43	71		53
Percent Heavy Vehicles	0		0	0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0	1		1
Configuration		LR		L		R

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L		LR		L		R
v (vph)	105	13		59		71		53
C(m) (vph)	995	856		182		76		549
v/c	0.11	0.02		0.32		0.93		0.10
95% queue length	0.35	0.05		1.32		4.86		0.32
Control Delay	9.0	9.3		34.0		179.5		12.3
LOS	A	A		D		F		B
Approach Delay				34.0			108.0	
Approach LOS				D			F	

HCS2000: Unsignalized Intersections Release 4.1d

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TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (SR 426) and Aulin Av
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (SR 426)
North/South Street: Aulin Avenue
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	95	675	16	12	483	50
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	26	188	4	3	134	14
Hourly Flow Rate, HFR	105	750	17	13	536	55
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?						No
Lanes	1	1	0	1	1	1
Configuration	L	TR		L	T	R
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	15		39	64		48
Peak Hour Factor, PHF	0.90		0.90	0.90		0.90
Peak-15 Minute Volume	4		11	18		13
Hourly Flow Rate, HFR	16		43	71		53
Percent Heavy Vehicles	0		0	0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
RT Channelized?						No
Lanes	0		0	1		1
Configuration		LR		L		R

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1		6.2	7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0	0	0		0	0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00	0.00	0.00		0.00	0.00		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	7.1		6.2	7.1		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)	2.20	2.20	3.50		3.30	3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0		0	0		0
t(f)	2.2	2.2	3.5		3.3	3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) 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	591	767	1584		758	1552		536
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500				1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9			12	
Conflicting Flows			758			536	
Potential Capacity			410			549	
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			410			549	
Probability of Queue free St.			0.90			0.90	
Step 2: LT from Major St.			**4**			**1**	
Conflicting Flows			767			591	
Potential Capacity			856			995	
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			856			995	
Probability of Queue free St.			0.98			0.89	
Maj L-Shared Prob Q free St.							
Step 3: TH from Minor St.			**8**			**11**	
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor			1.00			1.00	
Cap. Adj. factor due to Impeding mvmnt			0.88			0.88	
Movement Capacity							
Probability of Queue free St.			1.00			1.00	
Step 4: LT from Minor St.			**7**			**10**	
Conflicting Flows			1584			1552	
Potential Capacity			89			93	
Pedestrian Impedance Factor			1.00			1.00	
Maj. L, Min T Impedance factor			0.88			0.88	
Maj. L, Min T Adj. Imp Factor.			0.91			0.91	
Cap. Adj. factor due to Impeding mvmnt			0.82			0.81	
Movement Capacity			73			76	

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	0.88	0.88
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	1584	1552
Potential Capacity	89	93
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.88	0.88
Maj. L, Min T Adj. Imp Factor.	0.91	0.91
Cap. Adj. factor due to Impeding mvmnt	0.82	0.81
Movement Capacity	73	76
Results for Two-stage process:		
a		
y		
C t	73	76

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	16		43	71		53
Movement Capacity (vph)	73		410	76		549
Shared Lane Capacity (vph)		182				

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	73		410	76		549
Volume	16		43	71		53
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		182				
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	L	L		LR		L		R
v (vph)	105	13		59		71		53
C(m) (vph)	995	856		182		76		549
v/c	0.11	0.02		0.32		0.93		0.10
95% queue length	0.35	0.05		1.32		4.86		0.32
Control Delay	9.0	9.3		34.0		179.5		12.3
LOS	A	A		D		F		B
Approach Delay				34.0			108.0	
Approach LOS				D			F	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.89	0.98
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), 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	9.0	9.3
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS2000: Signalized Intersections Release 4.1e

Analyst: DRMP Inc.
Agency: City of Oviedo
Date: 10/7/2002
Period: PM Peak Hour
Project ID: 99-0170.028
E/W St: Broadway

Inter.: Broadway (SR 426) Lake Jessup
Area Type: All other areas
Jurisd:
Year : 2002-Existing

N/S St: Lake Jessup Avenue

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	1	1	0
LGConfig	L	TR		L	TR			LTR		L	TR	
Volume	17	371	45	135	569	79	61	100	71	72	97	23
Lane Width	12.0	12.0		12.0	12.0			12.0		12.0	12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A	A			NB Left	A		
Thru		A			Thru	A		
Right		A			Right	A		
Peds					Peds			
WB Left	A	A			SB Left	A		
Thru		A			Thru	A		
Right		A			Right	A		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	8.0	60.0				30.0		
Yellow	4.0	4.0				4.0		
All Red	1.0	1.0				1.0		

Cycle Length: 113.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	324	1805	0.06	0.65	12.9	B		
TR	992	1869	0.47	0.53	16.9	B	16.7	B
Westbound								
L	519	1805	0.29	0.65	9.8	A		
TR	990	1865	0.73	0.53	23.0	C	20.7	C
Northbound								
LTR	365	1376	0.71	0.27	43.7	D	43.7	D
Southbound								
L	241	908	0.33	0.27	34.2	C		
TR	490	1845	0.27	0.27	33.2	C	33.6	C

Intersection Delay = 24.4 (sec/veh) Intersection LOS = C

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/7/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (SR 426) Lake Jessup
Area Type: All other areas
Jurisdiction:
Analysis Year: 2002-Existing
Project ID: 99-0170.028

East/West Street: Broadway
North/South Street: Lake Jessup Avenue

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	17	371	45	135	569	79	61	100	71	72	97	23
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	5	103	13	38	158	22	17	28	20	20	27	6
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900			1900		1900	1900	
ParkExist												
NumPark												
No. Lanes	1	1	0	1	1	0	0	1	0	1	1	0
LGConfig	L		TR	L		TR			LTR	L		TR
Lane Width	12.0	12.0		12.0	12.0			12.0		12.0	12.0	
RTOR Vol			0			0			0			0
Adj Flow	19	462		150	720			258		80	134	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000			0.264		1.000	0.000	
Prop RTs		0.108			0.122			0.306			0.194	
Peds Bikes		0			0			0			0	
Buses	0	0		0	0			0		0	0	
%InProtPhase	0.0			0.0								

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

Ped Min g	3.2		3.2		3.2		3.2				

PHASE DATA

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A	A			NB Left	A		
Thru		A			Thru	A		
Right		A			Right	A		
Peds					Peds			
WB Left	A	A			SB Left	A		
Thru		A			Thru	A		
Right		A			Right	A		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	8.0	60.0			30.0			
Yellow	4.0	4.0			4.0			
All Red	1.0	1.0			1.0			

Cycle Length: 113.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	17	371	45	135	569	79	61	100	71	72	97	23
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj flow	19	412	50	150	632	88	68	111	79	80	108	26
No. Lanes	1	1	0	1	1	0	0	1	0	1	1	0
Lane group	L	TR		L	TR			LTR		L	TR	
Adj flow	19	462		150	720			258		80	134	
Prop LTs	1.000	0.000		1.000	0.000			0.264		1.000	0.000	
Prop RTs	0.108			0.122			0.306			0.194		

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

	Eastbound			Westbound			Northbound			Southbound		
LG	L	TR		L	TR		LTR			L	TR	
So	1900	1900		1900	1900		1900			1900	1900	
Lanes	1	1	0	1	1	0	0	1	0	1	1	0
fW	1.000	1.000		1.000	1.000			1.000		1.000	1.000	
fHV	1.000	1.000		1.000	1.000			1.000		1.000	1.000	
fG	1.000	1.000		1.000	1.000			1.000		1.000	1.000	
fP	1.000	1.000		1.000	1.000			1.000		1.000	1.000	
fBB	1.000	1.000		1.000	1.000			1.000		1.000	1.000	
fA	1.000	1.000		1.000	1.000			1.000		1.000	1.000	
fLU	1.000	1.000		1.000	1.000			1.000		1.000	1.000	
fRT		0.984			0.982			0.959			0.971	
fLT	0.950	1.000		0.950	1.000			0.756		0.478	1.000	
Sec.	0.179			0.357								
fLpb	1.000	1.000		1.000	1.000			1.000		1.000	1.000	
fRpb		1.000			1.000			1.000			1.000	
S	1805	1869		1805	1865			1376		908	1845	
Sec.	340			679								

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)		Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound								
Prot		19	1805		0.01	0.071	128	0.15
Perm		0	340		0.00	0.575	196	0.00
Left	L	19				0.65	324	0.06
Prot								
Perm								
Thru	TR	462	1869		0.25	0.53	992	0.47
Right								
Westbound								
Prot		128	1805	#	0.07	0.071	128	1.00
Perm		22	679		0.03	0.575	391	0.06
Left	L	150				0.65	519	0.29
Prot								
Perm								
Thru	TR	720	1865	#	0.39	0.53	990	0.73
Right								
Northbound								
Prot								
Perm								
Left								
Prot								
Perm								
Thru	LTR	258	1376	#	0.19	0.27	365	0.71
Right								
Southbound								
Prot								
Perm								
Left	L	80	908		0.09	0.27	241	0.33
Prot								
Perm								
Thru	TR	134	1845		0.07	0.27	490	0.27
Right								

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.64
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.74

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Del d2	Res Del d3	Lane Group Delay	LOS	Approach Delay	LOS
Eastbound												
L	0.06	0.65	12.8	1.000	324	0.11	0.1	0.0	12.9	B		
TR	0.47	0.53	16.5	1.000	992	0.11	0.3	0.0	16.9	B	16.7	B
Westbound												
L	0.29	0.65	9.5	1.000	519	0.11	0.3	0.0	9.8	A		
TR	0.73	0.53	20.2	1.000	990	0.29	2.7	0.0	23.0	C	20.7	C
Northbound												
LTR	0.71	0.27	37.5	1.000	365	0.27	6.2	0.0	43.7	D	43.7	D
Southbound												
L	0.33	0.27	33.4	1.000	241	0.11	0.8	0.0	34.2	C		

TR	0.27	0.27	32.9	1.000	490	0.11	0.3	0.0	33.2	C	33.6	C

Intersection delay = 24.4 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach		M	M		S
Cycle length, C	113.0 sec				
Total actual green time for LT lane group, G (s)		73.0	73.0		30.0
Effective permitted green time for LT lane group, g(s)		65.0	65.0		30.0
Opposing effective green time, go (s)		60.0	60.0		30.0
Number of lanes in LT lane group, N		1	1		1
Number of lanes in opposing approach, No		1	1		1
Adjusted LT flow rate, VLT (veh/h)		19	150		80
Proportion of LT in LT lane group, PLT		1.000	1.000		1.000
Proportion of LT in opposing flow, PLTo		0.00	0.00		0.26
Adjusted opposing flow rate, Vo (veh/h)		720	462		258
Lost time for LT lane group, tL		5.00	5.00		5.00
Computation					
LT volume per cycle, LTC=VLTC/3600		0.60	4.71		2.51
Opposing lane util. factor, fLUo		1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)		22.60	14.50		8.10
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g		0.0	0.0		0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)		1.00	1.00		1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]		0.47	0.47		0.73
gq, (see Exhibit C16-4,5,6,7,8)		35.33	18.30		12.54
gu=g-gq if gq>=gf, or = g-gf if gq<gf		29.67	46.70		17.46
n=Max(gq-gf)/2,0)		17.67	9.15		6.27
PTHo=1-PLTo		1.00	1.00		0.74
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]		1.00	1.00		1.00
EL1 (refer to Exhibit C16-3)		2.55	2.01		1.67
EL2=Max((1-Ptho**n)/Plto, 1.0)					3.24
fmin=2(1+PL)/g or fmin=2(1+Pl)/g		0.06	0.06		0.13
gdiff=max(gq-gf,0)		0.00	0.00		12.54
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)		0.18	0.36		0.48
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT		0.179	0.357		0.478

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

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

		EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				M	
Cycle length, C	113.0 sec				
Total actual green time for LT lane group, G (s)				30.0	
Effective permitted green time for LT lane group, g(s)				30.0	
Opposing effective green time, go (s)				30.0	

Number of lanes in LT lane group, N			1	
Number of lanes in opposing approach, No			1	
Adjusted LT flow rate, VLT (veh/h)			68	
Proportion of LT in LT lane group, PLT	0.000	0.000	0.264	0.000
Proportion of LT in opposing flow, PLTo			0.00	
Adjusted opposing flow rate, Vo (veh/h)			134	
Lost time for LT lane group, tL			5.00	
Computation				
LT volume per cycle, LTC=VLTC/3600			2.13	
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			4.21	
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g			1.6	
Opposing platoon ratio, Rpo (refer Exhibit 16-11)			1.00	
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]			0.73	
gq, (see Exhibit C16-4,5,6,7,8)			5.65	
gu=g-gq if gq>=gf, or = g-gf if gq<gf			24.35	
n=Max(gq-gf)/2,0)			2.04	
PTHo=1-PLTo			1.00	
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]			0.26	
EL1 (refer to Exhibit C16-3)			1.59	
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g			0.08	
gdiff=max(gq-gf,0)			0.00	
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)			0.76	
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT			0.756	

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

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

Permitted Left Turns

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

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

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	113.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v		19	150		
v/c ratio from Capacity Worksheet, X		0.06	0.29		
Protected phase effective green interval, g (s)		8.0	8.0		
Opposing queue effective green interval, gq		35.33	18.30		
Unopposed green interval, gu		29.67	46.70		
Red time r=(C-g-gq-gu)		40.0	40.0		
Arrival rate, qa=v/(3600(max[X,1.0]))		0.01	0.04		
Protected ph. departure rate, Sp=s/3600		0.501	0.501		
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)		0.21	0.26		
XPerm		0.06	0.22		
XProt		0.06	0.50		
Case		1	1		
Queue at beginning of green arrow, Qa		0.21	1.67		
Queue at beginning of unsaturated green, Qu		0.19	0.76		
Residual queue, Qr		0.00	0.00		
Uniform Delay, d1		12.8	9.5		

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 24.4 sec/veh Intersection LOS C

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	TR		L	TR			LTR		L	TR	
Init Queue	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Flow Rate	19	462		150	720			258		80	134	
So	1900	1900		1900	1900			1900		1900	1900	
No.Lanes	1	1	0	1	1	0	0	1	0	1	1	0
SL	501	1869		802	1865			1376		908	1845	
LnCapacity	324	992		519	990			365		241	490	
Flow Ratio	0.04	0.25		0.19	0.39			0.19		0.09	0.07	
v/c Ratio	0.06	0.47		0.29	0.73			0.71		0.33	0.27	
Grn Ratio	0.65	0.53		0.65	0.53			0.27		0.27	0.27	
I Factor		1.000			1.000			1.000			1.000	
AT or PVG	3	3		3	3			3		3	3	
Pltn Ratio	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
PF2	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Q1	0.2	9.0		1.7	17.3			7.3		2.0	3.3	
kB	0.4	0.8		0.5	0.8			0.4		0.3	0.5	
Q2	0.0	0.7		0.2	2.0			1.0		0.2	0.2	
Q Average	0.2	9.7		1.9	19.2			8.3		2.2	3.5	
Q Spacing	25.0	25.0		25.0	25.0			25.0		25.0	25.0	
Q Storage	0	0		0	0			0		0	0	
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2		1.2	1.2			1.2		1.2	1.2	
BOQ	0.3	11.4		2.3	22.4			9.8		2.6	4.2	
QSRatio												
85th Percentile Output:												
fB%	1.6	1.5		1.6	1.5			1.5		1.6	1.6	
BOQ	0.4	14.7		3.0	28.1			12.7		3.5	5.5	
QSRatio												
90th Percentile Output:												
fB%	1.8	1.6		1.8	1.6			1.7		1.8	1.7	
BOQ	0.4	16.0		3.4	29.9			13.8		3.8	6.1	
QSRatio												
95th Percentile Output:												
fB%	2.1	1.8		2.0	1.7			1.9		2.0	2.0	
BOQ	0.5	18.0		3.9	32.8			15.6		4.4	7.0	
QSRatio												
98th Percentile Output:												
fB%	2.7	2.2		2.6	1.9			2.2		2.5	2.5	
BOQ	0.6	21.1		4.9	37.1			18.5		5.6	8.7	
QSRatio												

ERROR MESSAGES

No errors to report.

HCS2000: Signalized Intersections Release 4.1e

Analyst: DRMP Inc.
Agency: City of Oviedo
Date: 10/7/2002
Period: PM Peak Hour
Project ID: 99-0170.028
E/W St: Broadway

Inter.:
Area Type: All other areas
Jurisd:
Year : 2002-Existing

N/S St: Central Avenue

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	LTR			LTR			LTR	
Volume	42	378	12	117	429	30	54	380	2	125	403	48
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A	A			NB Left	A		
Thru	A	A			Thru	A		
Right	A	A			Right	A		
Peds					Peds			
WB Left		A			SB Left	A	A	
Thru		A			Thru	A	A	
Right		A			Right	A	A	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	5.0	30.0				12.0	30.0	
Yellow	4.0	4.0				4.0	4.0	
All Red	1.0	1.0				1.0	1.0	

Cycle Length: 97.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	172	1805	0.27	0.41	21.9	C		
TR	780	1891	0.56	0.41	22.6	C	22.5	C
Westbound								
L	270	872	0.48	0.31	28.5	C		
LTR	582	1882	0.88	0.31	45.8	D	42.3	D
Northbound								
LTR	503	1625	0.96	0.31	63.6	E	63.6	E
Southbound								
LTR	614	1859	1.04	0.48	72.8	E	72.8	E

Intersection Delay = 51.4 (sec/veh) Intersection LOS = D

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/7/2002
Analysis Time Period: PM Peak Hour
Intersection:
Area Type: All other areas
Jurisdiction:
Analysis Year: 2002-Existing
Project ID: 99-0170.028

East/West Street: Broadway
North/South Street: Central Avenue

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	42	378	12	117	429	30	54	380	2	125	403	48
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	12	105	3	33	119	8	15	106	1	35	112	13
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900			1900			1900	
ParkExist												
NumPark												
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	LTR			LTR			LTR	
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
RTOR Vol		0			0			0			0	
Adj Flow	47	433		130	510			484			640	
%InSharedLn				0								
Prop LTs	1.000	0.000		1.000	0.000			0.124			0.217	
Prop RTs		0.030			0.065			0.004			0.083	
Peds Bikes	0			0			0			0		
Buses	0	0		0	0			0			0	
%InProtPhase	0.0									0.0		

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

Ped Min g	3.2	3.2	3.2	3.2				

PHASE DATA

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A	A			NB Left	A		
Thru	A	A			Thru	A		
Right	A	A			Right	A		
Peds					Peds			
WB Left		A			SB Left	A	A	
Thru		A			Thru	A	A	
Right		A			Right	A	A	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	5.0	30.0				12.0	30.0	
Yellow	4.0	4.0				4.0	4.0	
All Red	1.0	1.0				1.0	1.0	

Cycle Length: 97.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	42	378	12	117	429	30	54	380	2	125	403	48
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj flow	47	420	13	130	477	33	60	422	2	139	448	53
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Lane group	L	TR		L	LTR			LTR			LTR	
Adj flow	47	433		130	510			484			640	
Prop LTs	1.000	0.000		1.000	0.000			0.124			0.217	
Prop RTs		0.030			0.065			0.004			0.083	

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

	Eastbound			Westbound			Northbound			Southbound		
LG	L	TR		L	LTR			LTR			LTR	
So	1900	1900		1900	1900			1900			1900	
Lanes	1	1	0	1	1	0	0	1	0	0	1	0
fW	1.000	1.000		1.000	1.000			1.000			1.000	
fHV	1.000	1.000		1.000	1.000			1.000			1.000	
fG	1.000	1.000		1.000	1.000			1.000			1.000	
fP	1.000	1.000		1.000	1.000			1.000			1.000	
fBB	1.000	1.000		1.000	1.000			1.000			1.000	
fA	1.000	1.000		1.000	1.000			1.000			1.000	
fLU	1.000	1.000		1.000	1.000			1.000			1.000	
fRT		0.995			0.990			0.999			0.989	
fLT	0.950	1.000		0.459	1.000			0.856			0.989	
Sec.	0.116										0.566	
fLpb	1.000	1.000		1.000	1.000			1.000			1.000	
fRpb		1.000			1.000			1.000			1.000	
S	1805	1891		872	1882			1625			1859	
Sec.	220										1064	

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)		Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound								
Prot		47	1805	#	0.03	0.052	93	0.51
Perm		0	220		0.00	0.361	79	0.00
Left	L	47				0.41	172	0.27
Prot								
Perm								
Thru	TR	433	1891		0.23	0.41	780	0.56
Right								
Westbound								
Prot								
Perm								
Left	L	130	872		0.15	0.31	270	0.48
Prot								
Perm								
Thru	LTR	510	1882	#	0.27	0.31	582	0.88
Right								
Northbound								
Prot								
Perm								
Left								
Prot								
Perm								
Thru	LTR	484	1625		0.30	0.31	503	0.96
Right								
Southbound								
Prot								
Perm								
Left								
Prot		230	1859	#	0.12	0.124	230	1.00
Perm		410	1064	#	0.39	0.361	384	1.07
Thru	LTR	640				0.48	614	1.04
Right								

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.81
Total lost time per cycle, L = 15.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.95

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Del d2	Res Del d3	Lane Group Delay	LOS	Approach Delay	LOS
Eastbound												
L	0.27	0.41	21.0	1.000	172	0.11	0.9	0.0	21.9	C		
TR	0.56	0.41	21.7	1.000	780	0.15	0.9	0.0	22.6	C	22.5	C
Westbound												
L	0.48	0.31	27.2	1.000	270	0.11	1.4	0.0	28.5	C		
LTR	0.88	0.31	31.7	1.000	582	0.40	14.1	0.0	45.8	D	42.3	D
Northbound												
LTR	0.96	0.31	32.9	1.000	503	0.47	30.6	0.0	63.6	E	63.6	E
Southbound												

LTR	1.04	0.48	25.0	1.000	614	0.50	47.8	0.0	72.8	E	72.8	E

Intersection delay = 51.4 (sec/veh) Intersection LOS = D

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

			EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach			M	M		
Cycle length, C	97.0	sec				
Total actual green time for LT lane group, G (s)			40.0	30.0		
Effective permitted green time for LT lane group, g(s)			35.0	30.0		
Opposing effective green time, go (s)			30.0	40.0		
Number of lanes in LT lane group, N			1	1		
Number of lanes in opposing approach, No			1	1		
Adjusted LT flow rate, VLT (veh/h)			47	130		
Proportion of LT in LT lane group, PLT			1.000	1.000		
Proportion of LT in opposing flow, PLTo			0.00	0.00		
Adjusted opposing flow rate, Vo (veh/h)			510	433		
Lost time for LT lane group, tL			5.00	5.00		
Computation						
LT volume per cycle, LTC=VLTC/3600			1.27	3.50		
Opposing lane util. factor, fLUo			1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			13.74	11.67		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g			0.0	0.0		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)			1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]			0.69	0.59		
gq, (see Exhibit C16-4,5,6,7,8)			26.49	3.05		
gu=g-gq if gq>=gf, or = g-gf if gq<gf			8.51	26.95		
n=Max(gq-gf)/2,0)			13.24	1.53		
PTHo=1-PLTo			1.00	1.00		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]			1.00	1.00		
EL1 (refer to Exhibit C16-3)			2.10	1.96		
EL2=Max((1-Ptho**n)/Plto, 1.0)						
fmin=2(1+PL)/g or fmin=2(1+Pl)/g			0.11	0.13		
gdiff=max(gq-gf,0)			0.00	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)			0.12	0.46		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**						
Left-turn adjustment, fLT			0.116	0.459		

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

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

			EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				M	S	S
Cycle length, C	97.0	sec				
Total actual green time for LT lane group, G (s)				30.0	30.0	47.0
Effective permitted green time for LT lane group, g(s)				30.0	30.0	35.0
Opposing effective green time, go (s)				40.0	47.0	30.0

Number of lanes in LT lane group, N		1	1	1
Number of lanes in opposing approach, No		1	1	1
Adjusted LT flow rate, VLT (veh/h)		0	60	139
Proportion of LT in LT lane group, PLT	0.000	0.000	0.124	0.217
Proportion of LT in opposing flow, PLTo		0.00	0.22	0.12
Adjusted opposing flow rate, Vo (veh/h)		433	640	484
Lost time for LT lane group, tL		5.00	5.00	5.00
Computation				
LT volume per cycle, LTC=VLTC/3600		0.00	1.62	3.75
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)		11.67	17.24	13.04
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g		0.0	4.4	0.0
Opposing platoon ratio, Rpo (refer Exhibit 16-11)		1.00	1.00	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]		0.59	0.52	0.69
gq, (see Exhibit C16-4,5,6,7,8)		3.05	0.00	23.62
gu=g-gq if gq>=gf, or = g-gf if gq<gf		26.95	25.63	11.38
n=Max(gq-gf)/2,0)		1.53	0.00	11.81
PTHo=1-PLTo		1.00	0.78	0.88
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]		0.00	0.12	0.22
EL1 (refer to Exhibit C16-3)		2.15	2.64	2.26
EL2=Max((1-Ptho**n)/Plto, 1.0)			1.00	6.38
fmin=2(1+PL)/g or fmin=2(1+Pl)/g		0.07	0.07	0.07
gdiff=max(gq-gf,0)		0.00	0.00	23.62
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)		0.90	0.86	0.57
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT		1.000	0.856	0.566

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

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

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

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

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

			EBLT	WBLT	NBLT	SBLT
Cycle length, C	97.0	sec				
Adj. LT vol from Vol Adjustment Worksheet, v			47			
v/c ratio from Capacity Worksheet, X			0.27			
Protected phase effective green interval, g (s)			5.0			
Opposing queue effective green interval, gq			26.49			
Unopposed green interval, gu			8.51			
Red time r=(C-g-gq-gu)			57.0			
Arrival rate, qa=v/(3600(max[X,1.0]))			0.01			
Protected ph. departure rate, Sp=s/3600			0.501			
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)			0.25			
XPerm			0.21			
XProt			0.32			
Case			1			
Queue at beginning of green arrow, Qa			0.74			
Queue at beginning of unsaturated green, Qu			0.35			
Residual queue, Qr			0.00			
Uniform Delay, d1			21.0			

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 51.4 sec/veh Intersection LOS D

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	TR		L	LTR			LTR			LTR	
Init Queue	0.0	0.0		0.0	0.0			0.0			0.0	
Flow Rate	47	433		130	510			484			640	
So	1900	1900		1900	1900			1900			1900	
No.Lanes	1	1	0	1	1	0	0	1	0	0	1	0
SL	418	1891		872	1882			1625			1266	
LnCapacity	172	780		270	582			503			614	
Flow Ratio	0.11	0.23		0.15	0.27			0.30			0.51	
v/c Ratio	0.27	0.56		0.48	0.88			0.96			1.04	
Grn Ratio	0.41	0.41		0.31	0.31			0.31			0.48	
I Factor		1.000			1.000			1.000			1.000	
AT or PVG	3	3		3	3			3			3	
Pltn Ratio	1.00	1.00		1.00	1.00			1.00			1.00	
PF2	1.00	1.00		1.00	1.00			1.00			1.00	
Q1	0.8	8.9		2.8	13.0			12.8			10.1	
kB	0.3	0.6		0.3	0.5			0.5			0.5	
Q2	0.1	0.8		0.3	2.8			4.3			8.4	
Q Average	0.8	9.7		3.1	15.8			17.1			18.5	
Q Spacing	25.0	25.0		25.0	25.0			25.0			25.0	
Q Storage	0	0		0	0			0			0	
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2		1.2	1.2			1.2			1.2	
BOQ	1.0	11.4		3.7	18.5			20.0			21.5	
QSRatio												
85th Percentile Output:												
fB%	1.6	1.5		1.6	1.5			1.5			1.5	
BOQ	1.4	14.6		4.9	23.4			25.2			27.1	
QSRatio												
90th Percentile Output:												
fB%	1.8	1.6		1.7	1.6			1.6			1.6	
BOQ	1.5	15.9		5.5	25.0			26.9			28.9	
QSRatio												
95th Percentile Output:												
fB%	2.1	1.9		2.0	1.7			1.7			1.7	
BOQ	1.8	17.9		6.3	27.7			29.7			31.8	
QSRatio												
98th Percentile Output:												
fB%	2.6	2.2		2.5	2.0			2.0			1.9	
BOQ	2.2	21.0		7.8	31.6			33.7			36.0	
QSRatio												

ERROR MESSAGES

No errors to report.

HCS2000: Signalized Intersections Release 4.1e

Analyst: DRMP Inc.
Agency: City of Oviedo
Date: 10/7/2002
Period: PM Peak Hour
Project ID: 99-0170.028
E/W St: Broadway

Inter.:
Area Type: All other areas
Jurisd:
Year : 2002-Existing

N/S St: Station/Geneva Dr (426)

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L	TR		L	TR			LTR			LTR	
Volume	167	406	6	42	287	8	7	121	100	39	79	146
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A	A			NB Left	A		
Thru	A	A			Thru	A		
Right	A	A			Right	A		
Peds					Peds			
WB Left		A			SB Left		A	
Thru		A			Thru		A	
Right		A			Right		A	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	10.0	30.0				20.0	25.0	
Yellow	4.0	4.0				4.0	4.0	
All Red	1.0	1.0				1.0	1.0	

Cycle Length: 105.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	358	1805	0.52	0.43	22.1	C		
TR	813	1896	0.56	0.43	23.5	C	23.1	C
Westbound								
L	267	933	0.18	0.29	28.5	C		
TR	541	1892	0.61	0.29	34.4	C	33.6	C
Northbound								
LTR	340	1785	0.74	0.19	48.7	D	48.7	D
Southbound								
LTR	415	1745	0.71	0.24	42.1	D	42.1	D

Intersection Delay = 33.3 (sec/veh) Intersection LOS = C

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/7/2002
Analysis Time Period: PM Peak Hour
Intersection:
Area Type: All other areas
Jurisdiction:
Analysis Year: 2002-Existing
Project ID: 99-0170.028

East/West Street: Broadway
North/South Street: Station/Geneva Dr (426)

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	167	406	6	42	287	8	7	121	100	39	79	146
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	46	113	2	12	80	2	2	34	28	11	22	41
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900		1900	1900			1900			1900	
ParkExist												
NumPark												
No. Lanes		1	1	0	1	1	0	0	1	0	0	1	0
LGConfig	L		TR	L		TR			LTR			LTR	
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
RTOR Vol			0			0			0			0
Adj Flow	186	458		47	328			253			293	
%InSharedLn												
Prop LTs	1.000	0.000		1.000	0.000			0.032			0.147	
Prop RTs		0.015			0.027			0.439			0.553	
Peds Bikes		0			0			0			0	
Buses	0	0		0	0			0			0	
%InProtPhase	0.0											

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

Ped Min g	3.2		3.2		3.2		3.2				

PHASE DATA

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A	A			NB Left	A		
Thru	A	A			Thru	A		
Right	A	A			Right	A		
Peds					Peds			
WB Left		A			SB Left		A	
Thru		A			Thru		A	
Right		A			Right		A	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	10.0	30.0				20.0	25.0	
Yellow	4.0	4.0				4.0	4.0	
All Red	1.0	1.0				1.0	1.0	

Cycle Length: 105.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	167	406	6	42	287	8	7	121	100	39	79	146
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj flow	186	451	7	47	319	9	8	134	111	43	88	162
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Lane group	L	TR		L	TR			LTR			LTR	
Adj flow	186	458		47	328			253			293	
Prop LTs	1.000	0.000		1.000	0.000			0.032			0.147	
Prop RTs		0.015			0.027			0.439			0.553	

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

	Eastbound			Westbound			Northbound			Southbound		
LG	L	TR		L	TR		LTR			LTR		
So	1900	1900		1900	1900		1900			1900		
Lanes	1	1	0	1	1	0	0	1	0	0	1	0
fW	1.000	1.000		1.000	1.000			1.000			1.000	
fHV	1.000	1.000		1.000	1.000			1.000			1.000	
fG	1.000	1.000		1.000	1.000			1.000			1.000	
fP	1.000	1.000		1.000	1.000			1.000			1.000	
fBB	1.000	1.000		1.000	1.000			1.000			1.000	
fA	1.000	1.000		1.000	1.000			1.000			1.000	
fLU	1.000	1.000		1.000	1.000			1.000			1.000	
fRT		0.998			0.996			0.941			0.925	
fLT	0.950	1.000		0.491	1.000			0.998			0.993	
Sec.	0.294											
fLpb	1.000	1.000		1.000	1.000			1.000			1.000	
fRpb		1.000			1.000			1.000			1.000	
S	1805	1896		933	1892			1785			1745	
Sec.	558											

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)		Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound								
Prot		172	1805	#	0.10	0.095	172	1.00
Perm		14	558		0.03	0.333	186	0.08
Left	L	186				0.43	358	0.52
Prot								
Perm								
Thru	TR	458	1896		0.24	0.43	813	0.56
Right								
Westbound								
Prot								
Perm								
Left	L	47	933		0.05	0.29	267	0.18
Prot								
Perm								
Thru	TR	328	1892	#	0.17	0.29	541	0.61
Right								
Northbound								
Prot								
Perm								
Left								
Prot								
Perm								
Thru	LTR	253	1785	#	0.14	0.19	340	0.74
Right								
Southbound								
Prot								
Perm								
Left								
Prot								
Perm								
Thru	LTR	293	1745	#	0.17	0.24	415	0.71
Right								

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.58
Total lost time per cycle, L = 20.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.71

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.52	0.43	20.7	1.000	358	0.13	1.4	0.0	22.1	C		
TR	0.56	0.43	22.6	1.000	813	0.16	0.9	0.0	23.5	C	23.1	C
Westbound												
L	0.18	0.29	28.2	1.000	267	0.11	0.3	0.0	28.5	C		
TR	0.61	0.29	32.4	1.000	541	0.19	2.0	0.0	34.4	C	33.6	C
Northbound												
LTR	0.74	0.19	40.1	1.000	340	0.30	8.6	0.0	48.7	D	48.7	D
Southbound												

LTR	0.71	0.24	36.6	1.000	415	0.27	5.4	0.0	42.1	D	42.1 D

Intersection delay = 33.3 (sec/veh) Intersection LOS = C

SUPPLEMENTAL PERMITTED LT WORKSHEET for exclusive lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach	M	M		
Cycle length, C 105.0 sec				
Total actual green time for LT lane group, G (s)	45.0	30.0		
Effective permitted green time for LT lane group, g(s)	35.0	30.0		
Opposing effective green time, go (s)	30.0	45.0		
Number of lanes in LT lane group, N	1	1		
Number of lanes in opposing approach, No	1	1		
Adjusted LT flow rate, VLT (veh/h)	186	47		
Proportion of LT in LT lane group, PLT	1.000	1.000		
Proportion of LT in opposing flow, PLTo	0.00	0.00		
Adjusted opposing flow rate, Vo (veh/h)	328	458		
Lost time for LT lane group, tL	5.00	5.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	5.43	1.37		
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	9.57	13.36		
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	0.0	0.0		
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00	1.00		
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.71	0.57		
gq, (see Exhibit C16-4,5,6,7,8)	16.71	0.48		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	18.29	29.52		
n=Max(gq-gf)/2,0)	8.36	0.24		
PTHo=1-PLTo	1.00	1.00		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	1.00	1.00		
EL1 (refer to Exhibit C16-3)	1.78	2.00		
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.11	0.13		
gdiff=max(gq-gf,0)	0.00	0.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.29	0.49		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT	0.294	0.491		

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

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

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

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

SUPPLEMENTAL PERMITTED LT WORKSHEET for shared lefts

Input

	EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				
Cycle length, C 105.0 sec				
Total actual green time for LT lane group, G (s)				
Effective permitted green time for LT lane group, g(s)				
Opposing effective green time, go (s)				

Number of lanes in LT lane group, N				
Number of lanes in opposing approach, No				
Adjusted LT flow rate, VLT (veh/h)				
Proportion of LT in LT lane group, PLT	0.000	0.000	0.032	0.147
Proportion of LT in opposing flow, PLTo				
Adjusted opposing flow rate, Vo (veh/h)				
Lost time for LT lane group, tL				
Computation				
LT volume per cycle, LTC=VLTC/3600				
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)				
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g				
Opposing platoon ratio, Rpo (refer Exhibit 16-11)				
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]				
gq, (see Exhibit C16-4,5,6,7,8)				
gu=g-gq if gq>=gf, or = g-gf if gq<gf				
n=Max(gq-gf)/2,0)				
PTHo=1-PLTo				
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]				
EL1 (refer to Exhibit C16-3)				
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)				
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT				

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

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

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

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

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

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

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

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

		EBLT	WBLT	NBLT	SBLT
Cycle length, C	105.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v		186			
v/c ratio from Capacity Worksheet, X		0.52			
Protected phase effective green interval, g (s)		10.0			
Opposing queue effective green interval, gq		16.71			
Unopposed green interval, gu		18.29			
Red time r=(C-g-gq-gu)		60.0			
Arrival rate, qa=v/(3600(max[X,1.0]))		0.05			
Protected ph. departure rate, Sp=s/3600		0.501			
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)		0.30			
XPerm		0.33			
XProt		0.72			
Case		1			
Queue at beginning of green arrow, Qa		3.10			
Queue at beginning of unsaturated green, Qu		3.10			
Residual queue, Qr		0.00			
Uniform Delay, d1		20.7			

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 33.3 sec/veh Intersection LOS C

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	TR		L	TR		LTR			LTR		
Init Queue	0.0	0.0		0.0	0.0		0.0			0.0		
Flow Rate	186	458		47	328		253			293		
So	1900	1900		1900	1900		1900			1900		
No.Lanes	1	1	0	1	1	0	0	1	0	0	1	0
SL	835	1896		933	1892		1785			1745		
LnCapacity	358	813		267	541		340			415		
Flow Ratio	0.22	0.24		0.05	0.17		0.14			0.17		
v/c Ratio	0.52	0.56		0.18	0.61		0.74			0.71		
Grn Ratio	0.43	0.43		0.29	0.29		0.19			0.24		
I Factor		1.000			1.000		1.000			1.000		
AT or PVG	3	3		3	3		3			3		
Pltn Ratio	1.00	1.00		1.00	1.00		1.00			1.00		
PF2	1.00	1.00		1.00	1.00		1.00			1.00		
Q1	3.3	10.1		1.0	8.3		7.0			7.8		
kB	0.4	0.7		0.3	0.5		0.4			0.4		
Q2	0.4	0.8		0.1	0.8		1.1			1.0		
Q Average	3.7	10.9		1.1	9.0		8.0			8.8		
Q Spacing	25.0	25.0		25.0	25.0		25.0			25.0		
Q Storage	0	0		0	0		0			0		
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2		1.2	1.2		1.2			1.2		
BOQ	4.4	12.8		1.3	10.7		9.5			10.4		
QSRatio												
85th Percentile Output:												
fB%	1.6	1.5		1.6	1.5		1.5			1.5		
BOQ	5.8	16.5		1.8	13.8		12.3			13.5		
QSRatio												
90th Percentile Output:												
fB%	1.7	1.6		1.8	1.7		1.7			1.7		
BOQ	6.4	17.8		2.0	15.0		13.4			14.6		
QSRatio												
95th Percentile Output:												
fB%	2.0	1.8		2.1	1.9		1.9			1.9		
BOQ	7.3	19.9		2.3	16.9		15.1			16.5		
QSRatio												
98th Percentile Output:												
fB%	2.5	2.1		2.6	2.2		2.2			2.2		
BOQ	9.1	23.3		2.9	19.9		17.9			19.5		
QSRatio												

ERROR MESSAGES

No errors to report.

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (CR 419) & Division A
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (CR 419)
North/South Street: Division Avenue
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	103	587			416	179
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	114	652			462	198
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				11		204
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				12		226
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	114						238	
C(m) (vph)	938						460	
v/c	0.12						0.52	
95% queue length	0.41						2.91	
Control Delay	9.4						20.9	
LOS	A						C	
Approach Delay							20.9	
Approach LOS							C	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (CR 419) & Division A
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (CR 419)
North/South Street: Division Avenue
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	103	587			416	179
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Peak-15 Minute Volume	29	163			116	50
Hourly Flow Rate, HFR	114	652			462	198
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				11		204
Peak Hour Factor, PHF				0.90		0.90
Peak-15 Minute Volume				3		57
Hourly Flow Rate, HFR				12		226
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	652	
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:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.4		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)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) 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	660					1441		561
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							561	
Potential Capacity							531	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							531	
Probability of Queue free St.					1.00		0.57	
Step 2: LT from Major St.					4		1	
Conflicting Flows							660	
Potential Capacity							938	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							938	
Probability of Queue free St.					1.00		0.88	
Maj L-Shared Prob Q free St.							0.80	
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					0.80		0.80	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							1441	
Potential Capacity							148	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.80			
Maj. L, Min T Adj. Imp Factor.					0.85			
Cap. Adj. factor due to Impeding mvmnt					0.49		0.88	
Movement Capacity							130	

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	0.80	0.80	
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		1441	
Potential Capacity		148	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.80		
Maj. L, Min T Adj. Imp Factor.	0.85		
Cap. Adj. factor due to Impeding mvmnt	0.49	0.88	
Movement Capacity		130	
Results for Two-stage process:			
a			
y			
C t		130	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				12		226
Movement Capacity (vph)				130		531
Shared Lane Capacity (vph)					460	

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				130		531
Volume				12		226
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					460	
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						LR	
v (vph)	114						238	
C(m) (vph)	938						460	
v/c	0.12						0.52	
95% queue length	0.41						2.91	
Control Delay	9.4						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)	0.88	1.00
v(il), Volume for stream 2 or 5	652	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.80	
d(M,LT), Delay for stream 1 or 4	9.4	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	1.8	

HCS2000: Signalized Intersections Release 4.1e

Analyst: DRMP Inc.
Agency: City of Oviedo
Date: 10/7/2002
Period: PM Peak Hour
Project ID: 99-0170.028
E/W St: Broadway (CR 419)

Inter.: Broadway (CR419)Academy
Area Type: All other areas
Jurisd:
Year : 2002-Existing

N/S St: Academy/Stephan

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	0	0	1	0	0	1	0
LGConfig	L	TR			LTR			LTR			LTR	
Volume	15	727	32	33	574	3	60	2	45	10	4	8
Lane Width	12.0	12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A				NB Left	A		
Thru	A				Thru	A		
Right	A				Right	A		
Peds					Peds			
WB Left	A				SB Left	A		
Thru	A				Thru	A		
Right	A				Right	A		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	60.0					20.0		
Yellow	4.0					4.0		
All Red	1.0					1.0		

Cycle Length: 90.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
L	490	735	0.03	0.67	5.1	A		
TR	1259	1888	0.67	0.67	10.4	B	10.3	B
Westbound								
LTR	1177	1766	0.58	0.67	8.8	A	8.8	A
Northbound								
LTR	328	1474	0.36	0.22	30.3	C	30.3	C
Southbound								
LTR	354	1595	0.07	0.22	27.7	C	27.7	C

Intersection Delay = 11.4 (sec/veh) Intersection LOS = B

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/7/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (CR419)Academy
Area Type: All other areas
Jurisdiction:
Analysis Year: 2002-Existing
Project ID: 99-0170.028

East/West Street: Broadway (CR 419)
North/South Street: Academy/Stephan

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	15	727	32	33	574	3	60	2	45	10	4	8
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PK 15 Vol	4	202	9	9	159	1	17	1	13	3	1	2
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900			1900			1900			1900	
ParkExist												
NumPark												
No. Lanes		1	1	0		0	1	0		0	1	0		0	1	0
LGConfig	L		TR			LTR			LTR			LTR	
Lane Width	12.0	12.0			12.0			12.0			12.0	
RTOR Vol			0			0			0			0
Adj Flow	17	844			678			119			24	
%InSharedLn												
Prop LTs	1.000	0.000			0.055			0.563			0.458	
Prop RTs		0.043			0.004			0.420			0.375	
Peds Bikes		0			0			0			0	
Buses	0	0			0			0			0	
%InProtPhase												

Duration 0.25 Area Type: All other areas

OPERATING PARAMETERS

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

Ped Min g	3.2		3.2		3.2		3.2	

PHASE DATA

Phase Combination	1	2	3	4	5	6	7	8
EB Left	A				NB Left	A		
Thru	A				Thru	A		
Right	A				Right	A		
Peds					Peds			
WB Left	A				SB Left	A		
Thru	A				Thru	A		
Right	A				Right	A		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	60.0				20.0			
Yellow	4.0				4.0			
All Red	1.0				1.0			

Cycle Length: 90.0 secs

VOLUME ADJUSTMENT AND SATURATION FLOW WORKSHEET

Volume Adjustment

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume, V	15	727	32	33	574	3	60	2	45	10	4	8
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj flow	17	808	36	37	638	3	67	2	50	11	4	9
No. Lanes	1	1	0	0	1	0	0	1	0	0	1	0
Lane group	L	TR		LTR			LTR			LTR		
Adj flow	17	844		678			119			24		
Prop LTs	1.000	0.000		0.055			0.563			0.458		
Prop RTs	0.043			0.004			0.420			0.375		

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

	Eastbound				Westbound			Northbound			Southbound		
LG	L	TR			LTR			LTR			LTR		
So	1900	1900			1900			1900			1900		
Lanes	1	1	0	0	1	0	0	1	0	0	1	0	
fW	1.000	1.000			1.000			1.000			1.000		
fHV	1.000	1.000			1.000			1.000			1.000		
fG	1.000	1.000			1.000			1.000			1.000		
fP	1.000	1.000			1.000			1.000			1.000		
fBB	1.000	1.000			1.000			1.000			1.000		
fA	1.000	1.000			1.000			1.000			1.000		
fLU	1.000	1.000			1.000			1.000			1.000		
fRT		0.994			0.999			0.943			0.949		
fLT	0.387	1.000			0.930			0.822			0.884		
Sec.													
fLpb	1.000	1.000			1.000			1.000			1.000		
fRpb		1.000			1.000			1.000			1.000		
S	735	1888			1766			1474			1595		
Sec.													

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)		Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound								
Prot								
Perm								
Left	L	17	735		0.02	0.67	490	0.03
Prot								
Perm								
Thru	TR	844	1888	#	0.45	0.67	1259	0.67
Right								
Westbound								
Prot								
Perm								
Left								
Prot								
Perm								
Thru	LTR	678	1766		0.38	0.67	1177	0.58
Right								
Northbound								
Prot								
Perm								
Left								
Prot								
Perm								
Thru	LTR	119	1474	#	0.08	0.22	328	0.36
Right								
Southbound								
Prot								
Perm								
Left								
Prot								
Perm								
Thru	LTR	24	1595		0.02	0.22	354	0.07
Right								

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.53
Total lost time per cycle, L = 10.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 0.59

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
L	0.03	0.67	5.1	1.000	490	0.11	0.0	0.0	5.1	A		
TR	0.67	0.67	9.0	1.000	1259	0.24	1.4	0.0	10.4	B	10.3	B
Westbound												
LTR	0.58	0.67	8.1	1.000	1177	0.17	0.7	0.0	8.8	A	8.8	A
Northbound												
LTR	0.36	0.22	29.6	1.000	328	0.11	0.7	0.0	30.3	C	30.3	C
Southbound												

LTR	0.07	0.22	27.6	1.000	354	0.11	0.1	0.0	27.7	C	27.7	C

Intersection delay = 11.4 (sec/veh) Intersection LOS = B

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

			EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach			S			
Cycle length, C	90.0	sec				
Total actual green time for LT lane group, G (s)			60.0			
Effective permitted green time for LT lane group, g(s)			60.0			
Opposing effective green time, go (s)			60.0			
Number of lanes in LT lane group, N			1			
Number of lanes in opposing approach, No			1			
Adjusted LT flow rate, VLT (veh/h)			17			
Proportion of LT in LT lane group, PLT			1.000			
Proportion of LT in opposing flow, PLTo			0.05			
Adjusted opposing flow rate, Vo (veh/h)			678			
Lost time for LT lane group, tL			5.00			
Computation						
LT volume per cycle, LTC=VLTC/3600			0.43			
Opposing lane util. factor, fLUo			1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			16.95			
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g			0.0			
Opposing platoon ratio, Rpo (refer Exhibit 16-11)			1.00			
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]			0.33			
gq, (see Exhibit C16-4,5,6,7,8)			8.32			
gu=g-gq if gq>=gf, or = g-gf if gq<gf			51.68			
n=Max(gq-gf)/2,0)			4.16			
PTHo=1-PLTo			0.95			
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]			1.00			
EL1 (refer to Exhibit C16-3)			2.46			
EL2=Max((1-Ptho**n)/Plto, 1.0)			3.81			
fmin=2(1+PL)/g or fmin=2(1+Pl)/g			0.07			
gdiff=max(gq-gf,0)			8.32			
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)			0.39			
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**						
Left-turn adjustment, fLT			0.387			

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

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

			EB	WB	NB	SB
Opposed by Single(S) or Multiple(M) lane approach				M	S	S
Cycle length, C	90.0	sec				
Total actual green time for LT lane group, G (s)				60.0	20.0	20.0
Effective permitted green time for LT lane group, g(s)				60.0	20.0	20.0
Opposing effective green time, go (s)				60.0	20.0	20.0

Number of lanes in LT lane group, N		1	1	1
Number of lanes in opposing approach, No		1	1	1
Adjusted LT flow rate, VLT (veh/h)		37	67	11
Proportion of LT in LT lane group, PLT	0.000	0.055	0.563	0.458
Proportion of LT in opposing flow, PLTo		0.00	0.46	0.56
Adjusted opposing flow rate, Vo (veh/h)		844	24	119
Lost time for LT lane group, tL		5.00	5.00	5.00
Computation				
LT volume per cycle, LTC=VLTC/3600		0.93	1.68	0.28
Opposing lane util. factor, fLUo	1.000	1.000	1.000	1.000
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)		21.10	0.60	2.97
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g		21.1	1.1	8.7
Opposing platoon ratio, Rpo (refer Exhibit 16-11)		1.00	1.00	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]		0.33	0.78	0.78
gq, (see Exhibit C16-4,5,6,7,8)		10.74	0.00	3.69
gu=g-gq if gq>=gf, or = g-gf if gq<gf		38.94	18.91	11.35
n=Max(gq-gf)/2,0)		0.00	0.00	0.00
PTHo=1-PLTo		1.00	0.54	0.44
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]		0.05	0.56	0.46
EL1 (refer to Exhibit C16-3)		3.21	1.41	1.56
EL2=Max((1-Ptho**n)/Plto, 1.0)			1.00	1.00
fmin=2(1+PL)/g or fmin=2(1+Pl)/g		0.04	0.16	0.15
gdiff=max(gq-gf,0)		0.00	0.00	0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)		0.93	0.82	0.88
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00) or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT		0.930	0.822	0.884

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

SUPPLEMENTAL PEDESTRIAN-BICYCLE EFFECTS WORKSHEET

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

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

SUPPLEMENTAL UNIFORM DELAY WORKSHEET

	EBLT	WBLT	NBLT	SBLT
Cycle length, C	90.0 sec			
Adj. LT vol from Vol Adjustment Worksheet, v				
v/c ratio from Capacity Worksheet, X				
Protected phase effective green interval, g (s)				
Opposing queue effective green interval, gq				
Unopposed green interval, gu				
Red time r=(C-g-gq-gu)				
Arrival rate, qa=v/(3600(max[X,1.0]))				
Protected ph. departure rate, Sp=s/3600				
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)				
XPerm				
XProt				
Case				
Queue at beginning of green arrow, Qa				
Queue at beginning of unsaturated green, Qu				
Residual queue, Qr				
Uniform Delay, d1				

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

Appr/ Lane Group	Initial Unmet Demand Q veh	Dur. Unmet Demand t hrs.	Uniform Delay Unadj. ds	Uniform Delay Adj. d1 sec	Initial Queue Param. u	Final Unmet Demand Q veh	Initial Queue Delay d3 sec	Lane Group Delay d sec
Eastbound								
Westbound								
Northbound								
Southbound								

Intersection Delay 11.4 sec/veh Intersection LOS B

BACK OF QUEUE WORKSHEET

	Eastbound			Westbound			Northbound			Southbound		
LaneGroup	L	TR		LTR			LTR			LTR		
Init Queue	0.0	0.0		0.0			0.0			0.0		
Flow Rate	17	844		678			119			24		
So	1900	1900		1900			1900			1900		
No.Lanes	1	1	0	0	1	0	0	1	0	0	1	0
SL	735	1888		1766			1474			1595		
LnCapacity	490	1259		1177			328			354		
Flow Ratio	0.02	0.45		0.38			0.08			0.02		
v/c Ratio	0.03	0.67		0.58			0.36			0.07		
Grn Ratio	0.67	0.67		0.67			0.22			0.22		
I Factor		1.000		1.000			1.000			1.000		
AT or PVG	3	3		3			3			3		
Pltn Ratio	1.00	1.00		1.00			1.00			1.00		
PF2	1.00	1.00		1.00			1.00			1.00		
Q1	0.1	12.7		9.2			2.5			0.5		
kB	0.4	0.8		0.8			0.4			0.4		
Q2	0.0	1.6		1.0			0.2			0.0		
Q Average	0.2	14.3		10.2			2.7			0.5		
Q Spacing	25.0	25.0		25.0			25.0			25.0		
Q Storage	0	0		0			0			0		
Q S Ratio												
70th Percentile Output:												
fB%	1.2	1.2		1.2			1.2			1.2		
BOQ	0.2	16.7		12.0			3.2			0.6		
QSRatio												
85th Percentile Output:												
fB%	1.6	1.5		1.5			1.6			1.6		
BOQ	0.3	21.2		15.4			4.3			0.8		
QSRatio												
90th Percentile Output:												
fB%	1.8	1.6		1.6			1.7			1.8		
BOQ	0.3	22.8		16.7			4.8			0.9		
QSRatio												
95th Percentile Output:												
fB%	2.1	1.8		1.8			2.0			2.1		
BOQ	0.3	25.3		18.8			5.5			1.0		
QSRatio												
98th Percentile Output:												
fB%	2.7	2.0		2.2			2.5			2.7		
BOQ	0.4	29.0		22.0			6.8			1.3		
QSRatio												

ERROR MESSAGES

No errors to report.

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (CR 419) & Reed Rd
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (CR 419)
North/South Street: Reed Road
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	59	532			482	65
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	65	591			535	72
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						No
Lanes	1	1			1	1
Configuration	L	T			T	R
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				56		35
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				62		38
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L					L		R
v (vph)	65					62		38
C(m) (vph)	981					178		549
v/c	0.07					0.35		0.07
95% queue length	0.21					1.46		0.22
Control Delay	8.9					35.7		12.0
LOS	A					E		B
Approach Delay							26.7	
Approach LOS							D	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (CR 419) & Reed Rd
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (CR 419)
North/South Street: Reed Road
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	59	532			482	65
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Peak-15 Minute Volume	16	148			134	18
Hourly Flow Rate, HFR	65	591			535	72
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	1	1			1	1
Configuration	L	T			T	R
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				56		35
Peak Hour Factor, PHF				0.90		0.90
Peak-15 Minute Volume				16		10
Hourly Flow Rate, HFR				62		38
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						No
Lanes				1		1
Configuration				L		R

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.4		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)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) 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	607					1256		535
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							535	
Potential Capacity							549	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							549	
Probability of Queue free St.					1.00		0.93	
Step 2: LT from Major St.					4		1	
Conflicting Flows							607	
Potential Capacity							981	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							981	
Probability of Queue free St.					1.00		0.93	
Maj L-Shared Prob Q free St.								
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.93		0.93	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							1256	
Potential Capacity							191	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.93			
Maj. L, Min T Adj. Imp Factor.					0.95			
Cap. Adj. factor due to Impeding mvmnt					0.88		0.93	
Movement Capacity							178	

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	0.93	0.93
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		1256
Potential Capacity		191
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.93	
Maj. L, Min T Adj. Imp Factor.	0.95	
Cap. Adj. factor due to Impeding mvmnt	0.88	0.93
Movement Capacity		178
Results for Two-stage process:		
a		
y		
C t		178

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				62		38
Movement Capacity (vph)				178		549
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				178		549
Volume				62		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	L					L		R
v (vph)	65					62		38
C(m) (vph)	981					178		549
v/c	0.07					0.35		0.07
95% queue length	0.21					1.46		0.22
Control Delay	8.9					35.7		12.0
LOS	A					E		B
Approach Delay							26.7	
Approach LOS							D	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.93	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), 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	8.9	
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (CR419) & Carolyn Dr
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (CR 419)
North/South Street: Carolyn Dr / Evans St
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	16	740	64	29	632	12
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	17	822	71	32	702	13
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	1	1	0	1	1	0
Configuration	L	TR		L	TR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	39	2	7	9	0	12
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	43	2	7	10	0	13
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No	/		No	/
Lanes	1	1	0	0	1	0
Configuration	L	TR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L	L		TR		LTR	
v (vph)	17	32	43		9		23	
C(m) (vph)	895	768	71		217		135	
v/c	0.02	0.04	0.61		0.04		0.17	
95% queue length	0.06	0.13	2.63		0.13		0.59	
Control Delay	9.1	9.9	114.3		22.3		37.1	
LOS	A	A	F		C		E	
Approach Delay			98.3				37.1	
Approach LOS			F				E	

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (CR419) & Carolyn Dr
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (CR 419)
North/South Street: Carolyn Dr / Evans St
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	16	740	64	29	632	12
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	4	206	18	8	176	3
Hourly Flow Rate, HFR	17	822	71	32	702	13
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	1	1	0	1	1	0
Configuration	L	TR		L	TR	
Upstream Signal?	No			No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	39	2	7	9	0	12
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	11	1	2	2	0	3
Hourly Flow Rate, HFR	43	2	7	10	0	13
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No /			No /	
RT Channelized?						
Lanes	1	1	0	0	1	0
Configuration	L	TR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0	0	0	0	0	0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	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)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	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) 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	715	893	1671	1671	858	1668	1699	708
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s	1500		1500		1500		1500	
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	858	708
Potential Capacity	359	438
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	359	438
Probability of Queue free St.	0.98	0.97
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	893	715
Potential Capacity	768	895
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	768	895
Probability of Queue free St.	0.96	0.98
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	1671	1699
Potential Capacity	97	93
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	91	87
Probability of Queue free St.	0.98	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	1671	1668
Potential Capacity	77	77
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.94	0.92
Maj. L, Min T Adj. Imp Factor.	0.95	0.94
Cap. Adj. factor due to Impeding mvmnt	0.93	0.92
Movement Capacity	71	71

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	1671	1699
Potential Capacity	97	93
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	91	87
Result for 2 stage process:		
a		
y		
C t	91	87
Probability of Queue free St.	0.98	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	1671	1668
Potential Capacity	77	77
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.94	0.92
Maj. L, Min T Adj. Imp Factor.	0.95	0.94
Cap. Adj. factor due to Impeding mvmnt	0.93	0.92
Movement Capacity	71	71
Results for Two-stage process:		
a		
y		
C t	71	71

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	43	2	7	10	0	13
Movement Capacity (vph)	71	91	359	71	87	438
Shared Lane Capacity (vph)			217		135	

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	71	91	359	71	87	438
Volume	43	2	7	10	0	13
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh			217		135	
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	L	L	L		TR		LTR	
v (vph)	17	32	43		9		23	
C(m) (vph)	895	768	71		217		135	
v/c	0.02	0.04	0.61		0.04		0.17	
95% queue length	0.06	0.13	2.63		0.13		0.59	
Control Delay	9.1	9.9	114.3		22.3		37.1	
LOS	A	A	F		C		E	
Approach Delay				98.3			37.1	
Approach LOS				F			E	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	0.96
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), 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	9.1	9.9
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (CR 419) & Bishop/Wav
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (CR 419)
North/South Street: Bishop/Waverlee Woods Blvd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	33	627	23	25	538	35
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	36	696	25	27	597	38
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?		No			No	
Lanes	1	1	1	1	1	1
Configuration	L	T	R	L	T	R
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	7	3	27	17	1	21
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	7	3	30	18	1	23
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L	L		TR	L		TR
v (vph)	36	27	7		33	18		24
C(m) (vph)	958	890	99		359	96		449
v/c	0.04	0.03	0.07		0.09	0.19		0.05
95% queue length	0.12	0.09	0.22		0.30	0.65		0.17
Control Delay	8.9	9.2	44.1		16.0	51.0		13.5
LOS	A	A	E		C	F		B
Approach Delay			21.0			29.5		
Approach LOS			C			D		

HCS2000: Unsignalized Intersections Release 4.1d

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: DRMP Inc.
Agency/Co.: City of Oviedo
Date Performed: 10/4/2002
Analysis Time Period: PM Peak Hour
Intersection: Broadway (CR 419) & Bishop/Wav
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2002 - Existing
Project ID: 99-0170.028
East/West Street: Broadway (CR 419)
North/South Street: Bishop/Waverlee Woods Blvd
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	33	627	23	25	538	35
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	9	174	6	7	149	10
Hourly Flow Rate, HFR	36	696	25	27	597	38
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?			No			No
Lanes	1	1	1	1	1	1
Configuration	L	T	R	L	T	R
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	7	3	27	17	1	21
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Peak-15 Minute Volume	2	1	8	5	0	6
Hourly Flow Rate, HFR	7	3	30	18	1	23
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0	0	0	0	0	0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	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)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	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) 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	635	721	1450	1457	696	1448	1444	597
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	696	597
Potential Capacity	445	507
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	445	507
Probability of Queue free St.	0.93	0.95
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	721	635
Potential Capacity	890	958
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	890	958
Probability of Queue free St.	0.97	0.96
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	1457	1444
Potential Capacity	131	133
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.93	0.93
Movement Capacity	122	124
Probability of Queue free St.	0.98	0.99
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	1450	1448
Potential Capacity	110	110
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.93	0.91
Maj. L, Min T Adj. Imp Factor.	0.94	0.93
Cap. Adj. factor due to Impeding mvmnt	0.90	0.87
Movement Capacity	99	96

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	1457	1444
Potential Capacity	131	133
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.93	0.93
Movement Capacity	122	124
Result for 2 stage process:		
a		
y		
C t	122	124
Probability of Queue free St.	0.98	0.99
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	1450	1448
Potential Capacity	110	110
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.93	0.91
Maj. L, Min T Adj. Imp Factor.	0.94	0.93
Cap. Adj. factor due to Impeding mvmnt	0.90	0.87
Movement Capacity	99	96
Results for Two-stage process:		
a		
y		
C t	99	96

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	7	3	30	18	1	23
Movement Capacity (vph)	99	122	445	96	124	507
Shared Lane Capacity (vph)			359			449

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	99	122	445	96	124	507
Volume	7	3	30	18	1	23
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh			359			449
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	L	L	L		TR	L		TR
v (vph)	36	27	7		33	18		24
C(m) (vph)	958	890	99		359	96		449
v/c	0.04	0.03	0.07		0.09	0.19		0.05
95% queue length	0.12	0.09	0.22		0.30	0.65		0.17
Control Delay	8.9	9.2	44.1		16.0	51.0		13.5
LOS	A	A	E		C	F		B
Approach Delay				21.0			29.5	
Approach LOS				C			D	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.96	0.97
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), 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	8.9	9.2
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		