PREPARADO PARA
ING. JOSÉ A. MELÉNDEZ & ASSOCIATES

PROYECTO: PALACIOS DE GURABO GURABO, PUERTO RICO

Realizado por:

Ing. Marcos Bandas Acosta

Lic. Núm. 5512 P E

30 de junio de 2005

ANEXO
ANÁLISIS DE CAPACIDAD

ANÁLISIS DE CAPACIDAD

INT. PR-9944, CONECTOR Y RAMPA PR-30

6:45 – 7:45 A M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 6:45-7:45 a m
Intersection: Conector, PR-9944 y Rampa
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: Conector y Rampa PR-30
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	205			192	529
Peak-Hour Factor, PHF	0.25	0.81			0.79	0.94
Hourly Flow Rate, HFR	4	252			243	560
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Raised curb					
RT Channelized?						Yes
Lanes	0	2			1	1
Configuration		LT T			T	R
Upstream Signal?		Yes			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	897	130			
Peak Hour Factor, PHF	1.00	0.88	0.83			
Hourly Flow Rate, HFR	2	1020	156			
Percent Heavy Vehicles	0	1	1			
Percent Grade (%)		0			0	
Median Storage 1						
Flared Approach: Exists?						
Storage						
RT Channelized?			Yes			
Lanes	0	2	1			
Configuration		LT T	R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT		LT	T	R			
v (vph)	4		512	510	156			
C(m) (vph)	1438		962	961	1669			
v/c	0.00		0.53	0.53	0.09			
95% queue length	0.01		3.36	3.34	0.31			
Control Delay	7.5		13.0	13.0	7.4			
LOS	A		B	B	A			
Approach Delay				12.2				
Approach LOS				B				

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
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TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 6:45-7:45 a m
Intersection: Conector, PR-9944 y Rampa
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: Conector y Rampa PR-30
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	205			192	529
Peak-Hour Factor, PHF	0.25	0.81			0.79	0.94
Peak-15 Minute Volume	1	63			61	140
Hourly Flow Rate, HFR	4	252			243	560
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Raised curb					
RT Channelized?						Yes
Lanes	0	2			1	1
Configuration	LT	T			T	R
Upstream Signal?		Yes			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	897	130			
Peak Hour Factor, PHF	1.00	0.88	0.83			
Peak-15 Minute Volume	0	255	39			
Hourly Flow Rate, HFR	2	1020	156			
Percent Heavy Vehicles	0	1	1			
Percent Grade (%)		0			0	
Median Storage	1					
Flared Approach: Exists?						
Storage						
RT Channelized?			Yes			
Lanes	0	2	1			
Configuration	LT	T	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	0	1900	3	0	130	25	1478
	Through	0	1900	3	0	130	25	1478
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:	249	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1900	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		3.0*		3.0*	3.0*	3.0*			
t(c,hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
P(hv)		0		0	1	1			
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	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	3.0		2.3	3.0	3.0			
	2-stage	3.0		1.3	2.0	3.0			

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		2.00*	3.00*	2.00*			
t(f,HV)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)	0		0	1	1			
t(f)	2.2		2.0	3.0	2.0			

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	0	0		
Total Saturation Flow Rate, s (vph)	3800	3800		
Arrival Type	3	3		
Effective Green, g (sec)	0	0		
Cycle Length, C (sec)	130	130		
Rp (from Exhibit 16-11)	1.000	1.000		
Proportion vehicles arriving on green P	0.000	0.000		
g(q1)	0.0	0.0		

g(q2)	0.0	0.0
g(q)	0.0	0.0

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha	0.400			
beta	0.714			
Travel time, t(a) (sec)	40.218			
Smoothing Factor, F	0.080			
Proportion of conflicting flow, f	0.000	0.000		
Max platooned flow, V(c,max)	0	0		
Min platooned flow, V(c,min)	1500	1500		
Duration of blocked period, t(p)	0.0	0.0		
Proportion time blocked, p	0.000		0.000	

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

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)	1.000		
p(4)			
p(7)	1.000	1.000	1.000
p(8)	1.000	1.000	1.000
p(9)	1.000		
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	243		783	503	126			
s	3800		3800	3800	3800			
Px	1.000		1.000	1.000	1.000			
V c,u,x	243		783	503	126			
C r,x	1438		1346	961	1669			
C plat,x	1438		1346	961	1669			

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)	260	523	260	243				
s	3800	1700	3800	1700				
P(x)	1.000	1.000	1.000	1.000				
V(c,u,x)	260	523	260	243				
C(r,x)	1760	1717	1150	1153				
C(plat,x)	1760	1717	1150	1153				

Part 3 - Single Stage		
Conflicting Flows	503	
Potential Capacity	961	
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	958	
Result for 2 stage process:		
a	0.91	0.91
y	0.98	
C t	961	
Probability of Queue free St.	0.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows	260	
Potential Capacity	1760	781
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	1754	781
Part 2 - Second Stage		
Conflicting Flows	523	
Potential Capacity	1717	490
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.10
Movement Capacity	1717	49
Part 3 - Single Stage		
Conflicting Flows	783	
Potential Capacity	1346	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.00
Maj. L, Min T Adj. Imp Factor.		0.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.00
Movement Capacity	1342	
Results for Two-stage process:		
a	0.91	0.91
y	1.11	
C t	1403	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	2	1020	156			
Movement Capacity (vph)	1403	961	1669			
Shared Lane Capacity (vph)	962					

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	1403	961	1669			
Volume	2	1020	156			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh	962					
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		LT	T	R			
v (vph)	4		512	510	156			
C(m) (vph)	1438		962	961	1669			
v/c	0.00		0.53	0.53	0.09			
95% queue length	0.01		3.36	3.34	0.31			
Control Delay	7.5		13.0	13.0	7.4			
LOS	A		B	B	A			
Approach Delay				12.2				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(i1), Volume for stream 2 or 5	249	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1900	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	1.00	
d(M,LT), Delay for stream 1 or 4	7.5	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5	0.0	

ANÁLISIS DE CAPACIDAD

INT. PR-9944, CONECTOR Y RAMPA PR-30

3:00 – 4:00 P M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 3:00-4:00 p m
Intersection: Conector, PR-9944 y Rampa
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: Conector y Rampas PR-30
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	4	433			221	242
Peak-Hour Factor, PHF	0.50	0.90			0.76	0.92
Hourly Flow Rate, HFR	8	479			292	263
Percent Heavy Vehicles	1	--	--		--	--
Median Type	Raised curb					
RT Channelized?						Yes
Lanes	0	2			1	1
Configuration	LT	T			T	R
Upstream Signal?		Yes			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10	620	128			
Peak Hour Factor, PHF	0.50	0.96	0.74			
Hourly Flow Rate, HFR	20	644	172			
Percent Heavy Vehicles	0	1	1			
Percent Grade (%)		0			0	
Median Storage 1						
Flared Approach: Exists?						
Storage						
RT Channelized?			Yes			
Lanes	1	1	1			
Configuration	L	T	R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT		L	T	R			
v (vph)	8		20	644	172			
C(m) (vph)	1393		1364	892	1565			
v/c	0.01		0.01	0.72	0.11			
95% queue length	0.02		0.04	7.35	0.37			
Control Delay	7.6		7.7	19.3	7.6			
LOS	A		A	C	A			
Approach Delay				16.6				
Approach LOS				C				

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
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TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 3:00-4:00 p m
Intersection: Conector, PR-9944 y Rampa
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: Conector y Rampas PR-30
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	4	433			221	242
Peak-Hour Factor, PHF	0.50	0.90			0.76	0.92
Peak-15 Minute Volume	2	120			73	66
Hourly Flow Rate, HFR	8	479			292	263
Percent Heavy Vehicles	1	--	--		--	--
Median Type	Raised curb					
RT Channelized?						Yes
Lanes	0	2			1	1
Configuration	LT	T			T	R
Upstream Signal?		Yes			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10	620	128			
Peak Hour Factor, PHF	0.50	0.96	0.74			
Peak-15 Minute Volume	5	161	43			
Hourly Flow Rate, HFR	20	644	172			
Percent Heavy Vehicles	0	1	1			
Percent Grade (%)		0			0	
Median Storage	1					
Flared Approach: Exists?						
Storage						
RT Channelized?			Yes			
Lanes	1	1	1			
Configuration	L	T	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	0	1900	3	0	130	25	1478
	Through	0	1900	3	0	130	25	1478
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:	474	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1900	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		3.0*		3.0*	3.0*	3.0*			
t(c,hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
P(hv)		1		0	1	1			
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	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	3.0		2.3	3.0	3.0			
	2-stage	3.0		1.3	2.0	3.0			

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		2.00*	3.00*	2.00*			
t(f,HV)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)	1		0	1	1			
t(f)	2.2		2.0	3.0	2.0			

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	0	0		
Total Saturation Flow Rate, s (vph)	3800	3800		
Arrival Type	3	3		
Effective Green, g (sec)	0	0		
Cycle Length, C (sec)	130	130		
Rp (from Exhibit 16-11)	1.000	1.000		
Proportion vehicles arriving on green P	0.000	0.000		
g(q1)	0.0	0.0		

g(q2)	0.0	0.0
g(q)	0.0	0.0

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha	0.400			
beta	0.714			
Travel time, t(a) (sec)	40.218			
Smoothing Factor, F	0.080			
Proportion of conflicting flow, f	0.000	0.000		
Max platooned flow, V(c,max)	0	0		
Min platooned flow, V(c,min)	1500	1500		
Duration of blocked period, t(p)	0.0	0.0		
Proportion time blocked, p	0.000		0.000	

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

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)	1.000		
p(4)			
p(7)	1.000	1.000	1.000
p(8)	1.000	1.000	1.000
p(9)	1.000		
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	292		919	787	240			
s	3800		3800	3800	3800			
Px	1.000		1.000	1.000	1.000			
V c,u,x	292		919	787	240			
C r,x	1393		1278	844	1565			
C plat,x	1393		1278	844	1565			

Two-Stage Process

	7		8		10		11	
	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)	495	424	495	292				
s	3800	1700	3800	1700				
P(x)	1.000	1.000	1.000	1.000				
V(c,u,x)	495	424	495	292				
C(r,x)	1722	1733	1106	1144				
C(plat,x)	1722	1733	1106	1144				

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	240	
Potential Capacity	1565	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1565	
Probability of Queue free St.	0.89	1.00
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows		292
Potential Capacity		1393
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1393
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	787	
Potential Capacity	844	
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	838	
Probability of Queue free St.	0.28	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	919	
Potential Capacity	1278	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.28
Maj. L, Min T Adj. Imp Factor.		0.41
Cap. Adj. factor due to Impeding mvmnt	0.99	0.37
Movement Capacity	1271	

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	495	
Potential Capacity	1106	675
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity	1098	675
Probability of Queue free St.	0.41	1.00
Part 2 - Second Stage		
Conflicting Flows	292	
Potential Capacity	1144	549
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	1144	545

Part 3 - Single Stage		
Conflicting Flows	787	
Potential Capacity	844	
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	838	
Result for 2 stage process:		
a	0.91	0.91
y	0.87	
C t	892	
Probability of Queue free St.	0.28	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows	495	
Potential Capacity	1722	738
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	1.00
Movement Capacity	1709	738
Part 2 - Second Stage		
Conflicting Flows	424	
Potential Capacity	1733	530
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.37
Movement Capacity	1733	194
Part 3 - Single Stage		
Conflicting Flows	919	
Potential Capacity	1278	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.28
Maj. L, Min T Adj. Imp Factor.		0.41
Cap. Adj. factor due to Impeding mvmnt	0.99	0.37
Movement Capacity	1271	
Results for Two-stage process:		
a	0.91	0.91
y	0.96	
C t	1364	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	20	644	172			
Movement Capacity (vph)	1364	892	1565			
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	1364	892	1565			
Volume	20	644	172			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

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

Movement	1	4	7	8	9	10	11	12
Lane Config	LT		L	T	R			
v (vph)	8		20	644	172			
C(m) (vph)	1393		1364	892	1565			
v/c	0.01		0.01	0.72	0.11			
95% queue length	0.02		0.04	7.35	0.37			
Control Delay	7.6		7.7	19.3	7.6			
LOS	A		A	C	A			
Approach Delay				16.6				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(i1), Volume for stream 2 or 5	474	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1900	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.6	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5	0.0	

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-9944 Y PR-189

7:15 – 8:15 A M

CONDICIÓN EXISTENTE

HCS2000: Signalized Intersections Release 4.1c

Analyst: Marcos Bandas Acosta
Agency: Traffic Engineer Consultant
Date: 31/01/2005
Period: 7:15 - 8:15 a m
Project ID: Proyecto Palacios de Gurabo - Condición Existente
E/W St: PR-189

Inter.: PR-189 Y PR-9944
Area Type: CBD or Similar
Jurisd: Gurabo, PR
Year : 2005
N/S St: PR-9944

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig		LTR			LTR		L	T	R		LTR	
Volume	138	240	47	81	211	348	20	379	70	202	226	181
Lane Width		12.0			12.0		12.0	12.0	12.0		12.0	
RTOR Vol			5			5			10			10

Duration 1.00 Area Type: CBD or Similar

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	A			SB	Left		A		
Thru	A	A				Thru		A		
Right	A	A				Right		A		
Peds						Peds				
NB Right	A	A	A		EB	Right				
SB Right					WB	Right				
Green	10.0	12.0	30.0				31.0	31.0		
Yellow		4.0	4.0				4.0	4.0		
All Red	0.0	0.0	0.0				0.0	0.0		

Cycle Length: 130.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	906	2834	0.52	0.35	33.8	C	33.8	C
Westbound								
LTR	308	2689	2.56	0.17	2880	F	2880	F
Northbound								
L	387	1624	0.08	0.24	38.5	D		
T	408	1710	1.12	0.24	297.1	F	242.0	F
R	1018	1454	0.08	0.70	6.2	A		
Southbound								
LTR	727	3048	1.17	0.24	367.9	F	367.9	F

Intersection Delay = 1024 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 31/01/2005
Analysis Time Period: 7:15 - 8:15 a m
Intersection: PR-189 Y PR-9944
Area Type: CBD or Similar
Jurisdiction: Gurabo, PR
Analysis Year:
Project ID: Proyecto Palacios de Gurabo - Condición Existente

East/West Street: PR-189
North/South Street: PR-9944

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	138	240	47	81	211	348	20	379	70	202	226	181
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.96	0.87	0.84	0.68	0.74	0.89	0.63	0.83	0.76	0.68	0.76	0.67
PK 15 Vol	36	69	14	30	71	98	8	114	23	74	74	68
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900			1900		1900	1900	1900		1900	
ParkExist	X			X								
NumPark	20			20								
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig		LTR			LTR		L	T	R		LTR	
Lane Width		12.0			12.0		12.0	12.0	12.0		12.0	
RTOR Vol			5			5			10			10
Adj Flow		470			790		32	456	79		849	
%InSharedLn												
Prop LTs		0.306			0.152			0.000			0.349	
Prop RTs	0.106			0.489			0.000		1.000	0.303		
Peds Bikes	0			0			0			0		
Buses		0			0		0	0	0		0	
%InProtPhase	25.0			12.0								

Duration 1.00 Area Type: CBD or Similar

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		15.7			14.9			11.4			12.9	

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	A			SB	Left		A		
	Thru	A	A				Thru		A		
	Right	A	A				Right		A		
	Peds						Peds				
NB	Right	A	A	A		EB	Right				
SB	Right					WB	Right				
Green		10.0	12.0	30.0				31.0	31.0		
Yellow			4.0	4.0				4.0	4.0		
All Red		0.0	0.0	0.0				0.0	0.0		

Cycle Length: 130.0 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	138	240	47	81	211	348	20	379	70	202	226	181
PHF	0.96	0.87	0.84	0.68	0.74	0.89	0.63	0.83	0.76	0.68	0.76	0.67
Adj flow	144	276	50	120	284	386	32	456	79	296	296	257
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
Lane group		LTR			LTR		L	T	R		LTR	
Adj flow		470			790		32	456	79		849	
Prop LTs		0.306			0.152			0.000			0.349	
Prop RTs		0.106			0.489			0.000	1.000		0.303	

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

	Eastbound			Westbound			Northbound				Southbound		
LG	LTR			LTR			L	T	R		LTR		
So	1900			1900			1900	1900	1900		1900		
Lanes	0	2	0	0	2	0	1	1	1	0	2	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	0.900			0.900			1.000	1.000	1.000		1.000		
fBB	1.000			1.000			1.000	1.000	1.000		1.000		
fA	0.90			0.90			0.90	0.90	0.90		0.90		
fLU	0.95			0.95			1.00	1.00	1.00		0.95		
fRT	0.984			0.927				1.000	0.850		0.955		
fLT	0.985			0.992			0.950	1.000			0.983		
Sec.	0.620			0.552									
fLpb	1.000			1.000			1.000	1.000			1.000		
fRpb	1.000			1.000				1.000	1.000		1.000		
S	2834			2689			1624	1710	1454		3048		
Sec.	1783			1497									

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot		305	2834	# 0.11	0.262	741	0.41
Perm		165	1783	0.09	0.092	165	1.00
Thru	LTR	470			0.35	906	0.52
Right							
Westbound							
Prot							
Perm							
Left							
Prot		124	2689	# 0.05	0.046	124	1.00
Perm		666	1497	# 0.44	0.123	184	3.62
Thru	LTR	790			0.17	308	2.56
Right							
Northbound							
Prot							
Perm							
Left	L	32	1624	0.02	0.24	387	0.08
Prot							
Perm							
Thru	T	456	1710	# 0.27	0.24	408	1.12
Right	R	79	1454	0.05	0.70	1018	0.08
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	849	3048	# 0.28	0.24	727	1.17
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 1.14
Total lost time per cycle, L = 16.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.30

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.52	0.35	33.2	1.000	906	0.12	0.5	0.0	33.8	C	33.8	C
Westbound												
LTR	2.56	0.17	54.0	1.000	308	0.50	2826	0.0	2880	F	2880	F
Northbound												
L	0.08	0.24	38.5	1.000	387	0.11	0.1	0.0	38.5	D		
T	1.12	0.24	49.5	1.000	408	0.50	247.6	0.0	297.1	F	242.0	F
R	0.08	0.70	6.2	1.000	1018	0.11	0.0	0.0	6.2	A		
Southbound												
LTR	1.17	0.24	49.5	1.000	727	0.50	318.4	0.0	367.9	F	367.9	F

Intersection delay = 1024 (sec/veh) Intersection LOS = F

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

			EB	WB	NB	SB
Cycle length, C	130.0	sec				
Total actual green time for LT lane group, G (s)						
Effective permitted green time for LT lane group, g(s)						
Opposing effective green time, go (s)						
Number of lanes in LT lane group, N						
Number of lanes in opposing approach, No						
Adjusted LT flow rate, VLT (veh/h)						
Proportion of LT in LT lane group, PLT						
Proportion of LT in opposing flow, PLTo						
Adjusted opposing flow rate, Vo (veh/h)						
Lost time for LT lane group, tL						

Computation

LT volume per cycle, LTC=VLTC/3600				
Opposing lane util. factor, fLUo	0.95	0.95	0.95	1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)				
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g				
Opposing platoon ratio, Rpo (refer Exhibit 16-11)				
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]				
gq, (see Exhibit C16-4,5,6,7,8)				
gu=g-gq if gq>=gf, or = g-gf if gq<gf				
n=Max(gq-gf)/2,0)				
PTHo=1-PLTo				
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]				
EL1 (refer to Exhibit C16-3)				
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g				
gdiff=max(gq-gf,0)				
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)				
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)				
or flt=[fm+0.91(N-1)]/N**				
Left-turn adjustment, fLT				

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

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

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

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

SUPPLEMENTAL PERMITTED LT WORKSHEET
for shared lefts

Input

			EB	WB	NB	SB
Cycle length, C	130.0	sec				
Total actual green time for LT lane group, G (s)			46.0	22.0		
Effective permitted green time for LT lane group, g(s)			12.0	16.0		
Opposing effective green time, go (s)			22.0	46.0		
Number of lanes in LT lane group, N			2	2		
Number of lanes in opposing approach, No			2	2		
Adjusted LT flow rate, VLT (veh/h)			144	120		
Proportion of LT in LT lane group, PLT			0.306	0.152	0.000	0.349
Proportion of LT in opposing flow, PLTo			0.15	0.31		
Adjusted opposing flow rate, Vo (veh/h)			790	470		

Lost time for LT lane group, tL	4.00	4.00		
Computation				
LT volume per cycle, LTC=VLTC/3600	5.20	4.33		
Opposing lane util. factor, fLUo	0.95	0.95	0.95	1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	15.01	8.93		
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]	0.83	0.65		
gq, (see Exhibit C16-4,5,6,7,8)	8.00	12.00		
gu=g-gq if gq>=gf, or = g-gf if gq<gf	4.00	4.00		
n=Max(gq-gf)/2,0)	4.00	6.00		
PTHo=1-PLTo	0.85	0.69		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	0.97	0.56		
EL1 (refer to Exhibit C16-3)	3.18	2.29		
EL2=Max((1-Ptho**n)/Plto, 1.0)	3.18	2.90		
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.33	0.19		
gdiff=max(gq-gf,0)	8.00	12.00		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.33	0.19		
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	0.620	0.552		

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	130.0 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 1024 sec/veh Intersection LOS F

BACK OF QUEUE WORKSHEET

	Eastbound	Westbound	Northbound			Southbound
LaneGroup	LTR	LTR	L	T	R	LTR
Init Queue	0.0	0.0	0.0	0.0	0.0	0.0
Flow Rate	247	415	32	456	79	446
So	1900	1900	1900	1900	1900	1900
No.Lanes	0 2 0	0 2 0	1	1	1	0 2 0
SL	1491	1415	1624	1710	1454	1604
LnCapacity	476	162	387	408	1018	382

Flow Ratio	0.17	0.29	0.02	0.27	0.05	0.28		
v/c Ratio	0.52	2.56	0.08	1.12	0.08	1.17		
Grn Ratio	0.35	0.17	0.24	0.24	0.70	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	6.7	13.1	0.9	16.5	0.9	16.1		
kB	0.6	0.4	0.5	0.5	0.9	0.5		
Q2	0.6	127.1		0.0	28.1	0.1	35.1	
Q Average	7.3	140.1		0.9	44.5	1.0	51.2	
Q Spacing	25.0	25.0	25.0	25.0	25.0	25.0		
Q Storage	300	300	100	500	500	100		
Q S Ratio	0.6	11.7	0.2	2.2	0.0	12.8		
70th Percentile Output:								
fB%	1.2	1.1	1.2	1.1	1.2	1.1		
BOQ	8.6	154.6		1.1	50.5	1.2	57.7	
QSRatio	0.7	12.9	0.3	2.5	0.1	14.4		
85th Percentile Output:								
fB%	1.5	1.3	1.6	1.4	1.6	1.4		
BOQ	11.2	182.6		1.5	60.9	1.6	69.3	
QSRatio	0.9	15.2	0.4	3.0	0.1	17.3		
90th Percentile Output:								
fB%	1.7	1.4	1.8	1.4	1.8	1.4		
BOQ	12.2	196.3		1.7	64.3	1.7	73.2	
QSRatio	1.0	16.4	0.4	3.2	0.1	18.3		
95th Percentile Output:								
fB%	1.9	1.5	2.1	1.6	2.1	1.5		
BOQ	13.9	210.3		1.9	69.1	2.0	78.6	
QSRatio	1.2	17.5	0.5	3.5	0.1	19.6		
98th Percentile Output:								
fB%	2.3	1.7	2.6	1.7	2.6	1.7		
BOQ	16.6	238.3		2.5	77.2	2.6	88.0	
QSRatio	1.4	19.9	0.6	3.9	0.1	22.0		

ERROR MESSAGES

No errors to report.

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-9944 Y PR-189

3:00 – 4:00 P M

CONDICIÓN EXISTENTE

HCS2000: Signalized Intersections Release 4.1c

Analyst: Marcos Bandas Acosta
Agency: Traffic Engineer Consultant
Date: 31/01/2005
Period: 3:00 - 4:00 p m
Project ID: Proyecto Palacios de Gurabo - Condición Existente
E/W St: PR-189

Inter.: PR-189 Y PR-9944
Area Type: CBD or Similar
Jurisd: Gurabo, PR
Year : 2005
N/S St: PR-9944

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig	DefL	TR			LTR		L	T	R		LTR	
Volume	108	225	46	121	245	218	35	149	79	208	278	176
Lane Width	12.0	12.0			12.0		12.0	12.0	12.0		12.0	
RTOR Vol			5			5			10			10

Duration 1.00 Area Type: CBD or Similar

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	A			SB	Left		A		
Thru	A	A				Thru		A		
Right	A	A				Right		A		
Peds						Peds				
NB Right	A	A	A		EB	Right				
SB Right					WB	Right				
Green	10.0	12.0	30.0				31.0	31.0		
Yellow		4.0	4.0				4.0	4.0		
All Red	0.0	0.0	0.0				0.0	0.0		

Cycle Length: 130.0 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								
DefL	395	1300	0.36	0.26	37.0	D		
TR	487	1666	0.63	0.35	37.7	D	37.5	D
Westbound								
LTR	334	2728	2.24	0.17	2300	F	2300	F
Northbound								
L	387	1624	0.11	0.24	38.9	D		
T	408	1710	0.38	0.24	42.1	D	30.2	C
R	1018	1454	0.09	0.70	6.3	A		
Southbound								
LTR	734	3079	1.03	0.24	150.8	F	150.8	F

Intersection Delay = 826.9 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 31/01/2005
Analysis Time Period: 3:00 - 4:00 p m
Intersection: PR-189 Y PR-9944
Area Type: CBD or Similar
Jurisdiction: Gurabo, PR
Analysis Year:
Project ID: Proyecto Palacios de Gurabo - Condición Existente

East/West Street: PR-189 North/South Street: PR-9944

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	108	225	46	121	245	218	35	149	79	208	278	176
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.75	0.88	0.77	0.69	0.84	0.76	0.80	0.96	0.73	0.87	0.85	0.88
PK 15 Vol	36	64	15	44	73	72	11	39	27	60	82	50
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat	1900	1900			1900		1900	1900	1900		1900	
ParkExist	X			X								
NumPark	20			20								
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig	DefL	TR			LTR		L	T	R		LTR	
Lane Width	12.0	12.0			12.0		12.0	12.0	12.0		12.0	
RTOR Vol			5			5			10			10
Adj Flow	144	309			749		44	156	94		757	
%InSharedLn												
Prop LTs	1.000	0.000			0.235			0.000			0.317	
Prop RTs		0.172			0.375			0.000	1.000		0.250	
Peds Bikes		0			0			0			0	
Buses	0	0			0		0	0	0		0	
%InProtPhase	25.0			12.0								

Duration 1.00 Area Type: CBD or Similar

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		15.7			14.9			11.4			12.9	

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	A			SB	Left		A		
	Thru	A	A				Thru		A		
	Right	A	A				Right		A		
	Peds						Peds				
NB	Right	A	A	A		EB	Right				
SB	Right					WB	Right				
Green		10.0	12.0	30.0				31.0	31.0		
Yellow			4.0	4.0				4.0	4.0		
All Red		0.0	0.0	0.0				0.0	0.0		

Cycle Length: 130.0 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	108	225	46	121	245	218	35	149	79	208	278	176
PHF	0.75	0.88	0.77	0.69	0.84	0.76	0.80	0.96	0.73	0.87	0.85	0.88
Adj flow	144	256	53	176	292	281	44	156	94	240	328	189
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
Lane group	DefL	TR			LTR		L	T	R		LTR	
Adj flow	144	309			749		44	156	94		757	
Prop LTs	1.000	0.000			0.235			0.000			0.317	
Prop RTs		0.172			0.375		0.000		1.000		0.250	

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

	Eastbound			Westbound			Northbound			Southbound		
LG	DefL	TR			LTR		L	T	R		LTR	
So	1900	1900			1900		1900	1900	1900		1900	
Lanes	0	2	0	0	2	0	1	1	1	0	2	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	0.800	1.000			0.900		1.000	1.000	1.000		1.000	
fBB	1.000	1.000			1.000		1.000	1.000	1.000		1.000	
fA	0.90	0.90			0.90		0.90	0.90	0.90		0.90	
fLU	1.00	1.00			0.95		1.00	1.00	1.00		0.95	
fRT		0.974			0.944			1.000	0.850		0.963	
fLT	0.950	1.000			0.988		0.950	1.000			0.984	
Sec.	0.333				0.613							
fLpb	1.000	1.000			1.000		1.000	1.000			1.000	
fRpb		1.000			1.000			1.000	1.000		1.000	
S	1300	1666			2728		1624	1710	1454		3079	
Sec.	456				1691							

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		89	1300	0.07	0.262	340	0.26
Perm		55	456	0.12	0.092	55	1.00
Left	DefL	144			0.26	395	0.36
Prot							
Perm							
Thru	TR	309	1666	# 0.15	0.35	487	0.63
Right							
Westbound							
Prot							
Perm							
Left							
Prot		126	2728	# 0.05	0.046	126	1.00
Perm		623	1691	# 0.37	0.123	208	3.00
Thru	LTR	749			0.17	334	2.24
Right							
Northbound							
Prot							
Perm							
Left	L	44	1624	0.03	0.24	387	0.11
Prot							
Perm							
Thru	T	156	1710	# 0.09	0.24	408	0.38
Right	R	94	1454	0.06	0.70	1018	0.09
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	757	3079	# 0.25	0.24	734	1.03
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 0.91
Total lost time per cycle, L = 16.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.03

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
DefL	0.36	0.26	36.5	1.000	395	0.11	0.6	0.0	37.0	D		
TR	0.63	0.35	35.0	1.000	487	0.21	2.7	0.0	37.7	D	37.5	D
Westbound												
LTR	2.24	0.17	54.0	1.000	334	0.50	2246	0.0	2300	F	2300	F
Northbound												
L	0.11	0.24	38.7	1.000	387	0.11	0.1	0.0	38.9	D		
T	0.38	0.24	41.5	1.000	408	0.11	0.6	0.0	42.1	D	30.2	C
R	0.09	0.70	6.3	1.000	1018	0.11	0.0	0.0	6.3	A		
Southbound												
LTR	1.03	0.24	49.5	1.000	734	0.50	101.3	0.0	150.8	F	150.8	F

Intersection delay = 826.9 (sec/veh) Intersection LOS = F

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Cycle length, C	130.0 sec				
Total actual green time for LT lane group, G (s)		46.0			
Effective permitted green time for LT lane group, g(s)		12.0			
Opposing effective green time, go (s)		22.0			
Number of lanes in LT lane group, N		1			
Number of lanes in opposing approach, No		2			
Adjusted LT flow rate, VLT (veh/h)		144			
Proportion of LT in LT lane group, PLT		1.000			
Proportion of LT in opposing flow, PLTo		0.23			
Adjusted opposing flow rate, Vo (veh/h)		749			
Lost time for LT lane group, tL		4.00			
Computation					
LT volume per cycle, LTC=VLTC/3600		5.20			
Opposing lane util. factor, fLUo		0.95	1.00	0.95	1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)		14.24			
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]		0.83			
gq, (see Exhibit C16-4,5,6,7,8)		8.00			
gu=g-gq if gq>=gf, or = g-gf if gq<gf		4.00			
n=Max(gq-gf)/2,0)		4.00			
PTHo=1-PLTo		0.77			
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]		1.00			
EL1 (refer to Exhibit C16-3)		2.72			
EL2=Max((1-Ptho**n)/Plto, 1.0)		2.80			
fmin=2(1+PL)/g or fmin=2(1+Pl)/g		0.33			
gdiff=max(gq-gf,0)		8.00			
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)		0.33			

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		0.333			

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
Cycle length, C	130.0 sec				
Total actual green time for LT lane group, G (s)			22.0		
Effective permitted green time for LT lane group, g(s)			16.0		
Opposing effective green time, go (s)			46.0		
Number of lanes in LT lane group, N			2		
Number of lanes in opposing approach, No			2		
Adjusted LT flow rate, VLT (veh/h)			176		
Proportion of LT in LT lane group, PLT		0.000	0.235	0.000	0.317
Proportion of LT in opposing flow, PLTo			0.00		
Adjusted opposing flow rate, Vo (veh/h)			309		
Lost time for LT lane group, tL			4.00		
Computation					
LT volume per cycle, LTC=VLTC/3600			6.36		
Opposing lane util. factor, fLUo		0.95	1.00	0.95	1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			5.58		

```
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]                  0.65
gq, (see Exhibit C16-4,5,6,7,8)                               7.89
gu=g-gq if gq>=gf, or = g-gf if gq<gf                         8.11
n=Max(gq-gf)/2,0)                                             3.94
PTHo=1-PLTo                                                   1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]                            0.68
EL1 (refer to Exhibit C16-3)                                  1.90
EL2=Max((1-Ptho**n)/Plto, 1.0)
fmin=2(1+PL)/g  or  fmin=2(1+Pl)/g                            0.21
gdiff=max(gq-gf,0)                                            0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)           0.32
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                                     0.613

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
```

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-941 y PR-9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-941
North/South Street: PR-9944
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	43	434	22	80	138	121
Peak-Hour Factor, PHF	0.67	0.79	0.79	0.65	0.88	0.64
Hourly Flow Rate, HFR	64	552	28	124	156	187
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2	0	0	1	0
Configuration		LT	TR		LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	86	56	28	205	114	13
Peak Hour Factor, PHF	0.69	0.61	0.70	0.88	0.95	0.54
Hourly Flow Rate, HFR	124	92	40	232	120	23
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	2	0	0	2	0
Configuration		LT	TR		LT	TR

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT	LTR	LT		TR	LT		TR
v (vph)	64	124	170		86	292		83
C(m) (vph)	1350	1179	361		543	429		495
v/c	0.05	0.11	0.47		0.16	0.68		0.17
95% queue length	0.15	0.35	2.60		0.56	5.89		0.60
Control Delay	7.8	8.4	23.8		12.9	30.8		13.7
LOS	A	A	C		B	D		B
Approach Delay				20.1			27.0	
Approach LOS				C			D	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-941 y PR-9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-941
North/South Street: PR-9944
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	43	434	22	80	138	121
Peak-Hour Factor, PHF	0.67	0.79	0.79	0.65	0.88	0.64
Peak-15 Minute Volume	16	138	7	31	39	47
Hourly Flow Rate, HFR	64	552	28	124	156	187
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2	0	0	1	0
Configuration		LT	TR		LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	86	56	28	205	114	13
Peak Hour Factor, PHF	0.69	0.61	0.70	0.88	0.95	0.54
Peak-15 Minute Volume	31	23	10	58	30	6
Hourly Flow Rate, HFR	124	92	40	232	120	23
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	2	0	0	2	0
Configuration		LT	TR		LT	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:	0	156
Shared ln volume, major rt vehicles:	0	187
Sat flow rate, major th vehicles:	1900	1900
Sat flow rate, major rt vehicles:	1700	1900
Number of major street through lanes:	2	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)		3.1*	4.1	3.5*	3.5*	3.9*	3.5*	3.5*	3.9*
t(c,hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
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	3.1*	3.1*	3.5	3.5	3.9	3.5	3.5	3.9
	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)	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(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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	343	580	1263	1285	290	948	1206	250
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		1700		1700		3400		3400
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	290	250
Potential Capacity	907	931
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	907	931
Probability of Queue free St.	0.96	0.98
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	580	343
Potential Capacity	1179	1350
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1179	1350
Probability of Queue free St.	0.89	0.95
Maj L-Shared Prob Q free St.	0.87	0.95
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	1285	1206
Potential Capacity	485	506
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.83	0.83
Movement Capacity	403	420
Probability of Queue free St.	0.77	0.71
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	1263	948
Potential Capacity	523	626
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.59	0.64
Maj. L, Min T Adj. Imp Factor.	0.68	0.72
Cap. Adj. factor due to Impeding mvmnt	0.67	0.69
Movement Capacity	348	431

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	1285	1206
Potential Capacity	485	506

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.83	0.83
Movement Capacity	403	420

Result for 2 stage process:
a
y
C t

	403	420
Probability of Queue free St.	0.77	0.71

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	1263	948
Potential Capacity	523	626
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.59	0.64
Maj. L, Min T Adj. Imp Factor.	0.68	0.72
Cap. Adj. factor due to Impeding mvmnt	0.67	0.69
Movement Capacity	348	431

Results for Two-stage process:
a
y
C t

	348	431

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	124	92	40	232	120	23
Movement Capacity (vph)	348	403	907	431	420	931
Shared Lane Capacity (vph)	361		543	429		495

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	348	403	907	431	420	931
Volume	124	92	40	232	120	23
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max								
C sh			361		543	429		495
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	LTR	LT		TR	LT		TR
v (vph)	64	124	170		86	292		83
C(m) (vph)	1350	1179	361		543	429		495
v/c	0.05	0.11	0.47		0.16	0.68		0.17
95% queue length	0.15	0.35	2.60		0.56	5.89		0.60
Control Delay	7.8	8.4	23.8		12.9	30.8		13.7
LOS	A	A	C		B	D		B
Approach Delay				20.1			27.0	
Approach LOS				C			D	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.95	0.89
v(il), Volume for stream 2 or 5	0	156
v(i2), Volume for stream 3 or 6	0	187
s(il), Saturation flow rate for stream 2 or 5	1900	1900
s(i2), Saturation flow rate for stream 3 or 6	1700	1900
P*(oj)	0.95	0.87
d(M,LT), Delay for stream 1 or 4	7.8	8.4
N, Number of major street through lanes	2	1
d(rank,1) Delay for stream 2 or 5		1.1

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-9944 Y PR-941

3:00 – 4:00 P M

CONDICIÓN EXISTENTE

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 3:00-4:00 p m
Intersection: PR-941 y PR-9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-941
North/South Street: PR-9944
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	21	149	29	170	192	76
Peak-Hour Factor, PHF	0.58	0.56	0.73	0.85	0.92	0.83
Hourly Flow Rate, HFR	36	268	39	199	207	92
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2	0	0	1	0
Configuration	LT		TR	LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	96	101	29	119	58	20
Peak Hour Factor, PHF	0.60	0.90	0.43	0.80	0.58	0.63
Hourly Flow Rate, HFR	159	111	68	147	100	32
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		-5			2	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	2	0	0	2	0
Configuration	LT		TR	LT		TR

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT	LTR	LT		TR	LT		TR
v (vph)	36	199	214		123	197		82
C(m) (vph)	1274	1265	403		629	412		553
v/c	0.03	0.16	0.53		0.20	0.48		0.15
95% queue length	0.09	0.56	3.28		0.73	2.68		0.52
Control Delay	7.9	8.4	23.9		12.1	21.7		12.6
LOS	A	A	C		B	C		B
Approach Delay				19.6			19.0	
Approach LOS				C			C	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 3:00-4:00 p m
Intersection: PR-941 y PR-9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-941
North/South Street: PR-9944
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	21	149	29	170	192	76
Peak-Hour Factor, PHF	0.58	0.56	0.73	0.85	0.92	0.83
Peak-15 Minute Volume	9	67	10	50	52	23
Hourly Flow Rate, HFR	36	268	39	199	207	92
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2	0	0	1	0
Configuration	LT		TR	LTR		
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	96	101	29	119	58	20
Peak Hour Factor, PHF	0.60	0.90	0.43	0.80	0.58	0.63
Peak-15 Minute Volume	40	28	17	37	25	8
Hourly Flow Rate, HFR	159	111	68	147	100	32
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		-5			2	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	2	0	0	2	0
Configuration	LT		TR	LT		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:	0	207
Shared ln volume, major rt vehicles:	0	92
Sat flow rate, major th vehicles:	1900	1900
Sat flow rate, major rt vehicles:	1700	1900
Number of major street through lanes:	2	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	4.1	3.5*	3.5*	3.9*	3.5*	3.5*	3.9*
t(c,hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
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				-0.05	-0.05	-0.05	0.02	0.02	0.02
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	3.5	3.5	3.9	3.5	3.5	3.9*
	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)	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(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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	299	307	1077	1057	154	913	1030	253
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		1700		1700		3400		3400
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	154	253
Potential Capacity	990	929
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	990	929
Probability of Queue free St.	0.93	0.97
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	307	299
Potential Capacity	1265	1274
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1265	1274
Probability of Queue free St.	0.84	0.97
Maj L-Shared Prob Q free St.	0.81	0.97
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	1057	1030
Potential Capacity	549	555
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.79	0.79
Movement Capacity	434	439
Probability of Queue free St.	0.74	0.77
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	1077	913
Potential Capacity	584	638
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.61	0.59
Maj. L, Min T Adj. Imp Factor.	0.70	0.68
Cap. Adj. factor due to Impeding mvmnt	0.67	0.63
Movement Capacity	393	403

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	1057	1030
Potential Capacity	549	555

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.79	0.79
Movement Capacity	434	439
Result for 2 stage process:		
a		
y		
C t	434	439
Probability of Queue free St.	0.74	0.77
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	1077	913
Potential Capacity	584	638
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.61	0.59
Maj. L, Min T Adj. Imp Factor.	0.70	0.68
Cap. Adj. factor due to Impeding mvmnt	0.67	0.63
Movement Capacity	393	403
Results for Two-stage process:		
a		
y		
C t	393	403

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	159	111	68	147	100	32
Movement Capacity (vph)	393	434	990	403	439	929
Shared Lane Capacity (vph)	403		629	412		553

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	393	434	990	403	439	929
Volume	159	111	68	147	100	32
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max								
C sh			403		629	412		553
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	LTR	LT		TR	LT		TR
v (vph)	36	199	214		123	197		82
C(m) (vph)	1274	1265	403		629	412		553
v/c	0.03	0.16	0.53		0.20	0.48		0.15
95% queue length	0.09	0.56	3.28		0.73	2.68		0.52
Control Delay	7.9	8.4	23.9		12.1	21.7		12.6
LOS	A	A	C		B	C		B
Approach Delay				19.6			19.0	
Approach LOS				C			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	0.84
v(il), Volume for stream 2 or 5	0	207
v(i2), Volume for stream 3 or 6	0	92
s(il), Saturation flow rate for stream 2 or 5	1900	1900
s(i2), Saturation flow rate for stream 3 or 6	1700	1900
P*(oj)	0.97	0.81
d(M,LT), Delay for stream 1 or 4	7.9	8.4
N, Number of major street through lanes	2	1
d(rank,1) Delay for stream 2 or 5		1.6

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-9944 Y PR-943

7:15 – 8:15 A M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-943 y PR-9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	36	0	0	82	579
Peak-Hour Factor, PHF	0.44	0.75	0.25	0.25	0.73	0.93
Hourly Flow Rate, HFR	16	48	0	0	111	623
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized?						No
Lanes	0	1	0	0	1	1
Configuration		LTR		LT		R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	1	0	166	1	12
Peak Hour Factor, PHF	0.25	0.25	0.25	0.92	0.25	0.50
Hourly Flow Rate, HFR	0	4	0	180	4	24
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	1	0	1	1	0
Configuration		LTR		L		TR

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LT		LTR		L		TR
v (vph)	16	0		4		180		28
C(m) (vph)	1102	1595		826		946		1010
v/c	0.01	0.00		0.00		0.19		0.03
95% queue length	0.04	0.00		0.01		0.70		0.09
Control Delay	8.3	7.3		9.4		9.7		8.7
LOS	A	A		A		A		A
Approach Delay				9.4			9.6	
Approach LOS				A			A	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-943 y PR-9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	36	0	0	82	579
Peak-Hour Factor, PHF	0.44	0.75	0.25	0.25	0.73	0.93
Peak-15 Minute Volume	4	12	0	0	28	156
Hourly Flow Rate, HFR	16	48	0	0	111	623
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized?						No
Lanes	0	1	0	0	1	1
Configuration		LTR		LT		R
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	1	0	166	1	12
Peak Hour Factor, PHF	0.25	0.25	0.25	0.92	0.25	0.50
Peak-15 Minute Volume	0	1	0	45	1	6
Hourly Flow Rate, HFR	0	4	0	180	4	24
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	1	0	1	1	0
Configuration		LTR		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:	48	111
Shared ln volume, major rt vehicles:	0	0
Sat flow rate, major th vehicles:	1800	1800
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	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)		3.0*	3.0*	3.0*	3.0*	3.0*	3.0*	3.0*	3.0*
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	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	2.00*	3.00*	2.00*	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	2.0	3.0	2.0	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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	734	48	516	814	48	193	191	111
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		1700		1700		1700		1700
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	48	111
Potential Capacity	1753	1046
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1753	1046
Probability of Queue free St.	1.00	0.98
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	48	734
Potential Capacity	1595	1102
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1595	1102
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.	1.00	0.99
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	814	191
Potential Capacity	839	852
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	826	839
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	516	193
Potential Capacity	1347	960
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	0.98
Maj. L, Min T Adj. Imp Factor.	0.99	0.98
Cap. Adj. factor due to Impeding mvmnt	0.96	0.98
Movement Capacity	1296	946

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	814	191
Potential Capacity	839	852

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	826	839

Result for 2 stage process:		
a		
y		
C t	826	839
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	516	193
Potential Capacity	1347	960
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	0.98
Maj. L, Min T Adj. Imp Factor.	0.99	0.98
Cap. Adj. factor due to Impeding mvmnt	0.96	0.98
Movement Capacity	1296	946

Results for Two-stage process:		
a		
y		
C t	1296	946

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	0	4	0	180	4	24
Movement Capacity (vph)	1296	826	1753	946	839	1046
Shared Lane Capacity (vph)		826				1010

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	1296	826	1753	946	839	1046
Volume	0	4	0	180	4	24
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max		
C sh	826	1010
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	LTR	LT		LTR		L		TR
v (vph)	16	0		4		180		28
C(m) (vph)	1102	1595		826		946		1010
v/c	0.01	0.00		0.00		0.19		0.03
95% queue length	0.04	0.00		0.01		0.70		0.09
Control Delay	8.3	7.3		9.4		9.7		8.7
LOS	A	A		A		A		A
Approach Delay				9.4			9.6	
Approach LOS				A			A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(il), Volume for stream 2 or 5	48	111
v(i2), Volume for stream 3 or 6	0	0
s(il), Saturation flow rate for stream 2 or 5	1800	1800
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.99	1.00
d(M,LT), Delay for stream 1 or 4	8.3	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.1	0.0

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-9944 Y PR-943

2:45 – 3:45 P M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 2:45-3:45 p m
Intersection: PR-943 y PR-9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	8	46	0	0	21	171
Peak-Hour Factor, PHF	0.50	0.88	0.25	0.25	0.75	0.86
Hourly Flow Rate, HFR	16	52	0	0	28	199
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized?						No
Lanes	0	1	0	0	1	1
Configuration		LTR		LT		R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	2	1	207	2	14
Peak Hour Factor, PHF	0.25	0.50	1.00	0.89	0.50	0.58
Hourly Flow Rate, HFR	0	4	1	232	4	24
Percent Heavy Vehicles	0	0	0	1	0	0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	1	0	1	1	0
Configuration		LTR		L		TR

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LT		LTR		L		TR
v (vph)	16	0		5		232		28
C(m) (vph)	1450	1592		1131		973		1042
v/c	0.01	0.00		0.00		0.24		0.03
95% queue length	0.03	0.00		0.01		0.94		0.08
Control Delay	7.5	7.3		8.2		9.9		8.6
LOS	A	A		A		A		A
Approach Delay				8.2			9.7	
Approach LOS				A			A	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 2:45-3:45 p m
Intersection: PR-943 y PR-9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	8	46	0	0	21	171
Peak-Hour Factor, PHF	0.50	0.88	0.25	0.25	0.75	0.86
Peak-15 Minute Volume	4	13	0	0	7	50
Hourly Flow Rate, HFR	16	52	0	0	28	199
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized?						No
Lanes	0	1	0	0	1	1
Configuration		LTR		LT		R
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	2	1	207	2	14
Peak Hour Factor, PHF	0.25	0.50	1.00	0.89	0.50	0.58
Peak-15 Minute Volume	0	1	0	58	1	6
Hourly Flow Rate, HFR	0	4	1	232	4	24
Percent Heavy Vehicles	0	0	0	1	0	0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	1	0	1	1	0
Configuration		LTR		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:	52	28
Shared ln volume, major rt vehicles:	0	0
Sat flow rate, major th vehicles:	1900	1900
Sat flow rate, major rt vehicles:	1900	1700
Number of major street through lanes:	1	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)		3.0*	3.0*	3.0*	3.0*	3.0*	3.0*	3.0*	3.0*
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	1	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	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	2.00*	3.00*	2.00*	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	1	0	0
t(f)	2.2	2.2	2.0	3.0	2.0	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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	227	52	226	311	52	114	112	28
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		1700		1700		1700		1700
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	52	28
Potential Capacity	1749	1079
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1749	1079
Probability of Queue free St.	1.00	0.98
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows	52	227
Potential Capacity	1592	1450
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1592	1450
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.	1.00	0.99
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows	311	112
Potential Capacity	1051	872
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	1039	862
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows	226	114
Potential Capacity	1587	985
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	0.98
Maj. L, Min T Adj. Imp Factor.	0.99	0.99
Cap. Adj. factor due to Impeding mvmnt	0.97	0.99
Movement Capacity	1533	973

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	311	112
Potential Capacity	1051	872

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	1039	862

Result for 2 stage process:		
a		
y		
C t	1039	862
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	226	114
Potential Capacity	1587	985
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	0.98
Maj. L, Min T Adj. Imp Factor.	0.99	0.99
Cap. Adj. factor due to Impeding mvmnt	0.97	0.99
Movement Capacity	1533	973

Results for Two-stage process:		
a		
y		
C t	1533	973

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	0	4	1	232	4	24
Movement Capacity (vph)	1533	1039	1749	973	862	1079
Shared Lane Capacity (vph)		1131				1042

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	1533	1039	1749	973	862	1079
Volume	0	4	1	232	4	24
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max		
C sh	1131	1042
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	LTR	LT		LTR		L		TR
v (vph)	16	0		5		232		28
C(m) (vph)	1450	1592		1131		973		1042
v/c	0.01	0.00		0.00		0.24		0.03
95% queue length	0.03	0.00		0.01		0.94		0.08
Control Delay	7.5	7.3		8.2		9.9		8.6
LOS	A	A		A		A		A
Approach Delay				8.2			9.7	
Approach LOS				A			A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(i1), Volume for stream 2 or 5	52	28
v(i2), Volume for stream 3 or 6	0	0
s(i1), Saturation flow rate for stream 2 or 5	1900	1900
s(i2), Saturation flow rate for stream 3 or 6	1900	1700
P*(oj)	0.99	1.00
d(M,LT), Delay for stream 1 or 4	7.5	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.1	0.0

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-943 Y PR-9945

7:15 – 8:15 A M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-943 y PR-9945
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-9945
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	16	178			613	25
Peak-Hour Factor, PHF	0.50	0.91			0.91	0.63
Hourly Flow Rate, HFR	32	196			675	40
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2			2	0
Configuration		LT	T		T	TR
Upstream Signal?			No		No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				36		48
Peak Hour Factor, PHF				0.64		0.71
Hourly Flow Rate, HFR				56		67
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?						
Storage						
RT Channelized?						No
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	32					56		67
C(m) (vph)	1113					852		950
v/c	0.03					0.07		0.07
95% queue length	0.09					0.21		0.23
Control Delay	8.3					9.5		9.1
LOS	A					A		A
Approach Delay							9.3	
Approach LOS							A	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-943 y PR-9945
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-9945
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	16	178			613	25
Peak-Hour Factor, PHF	0.50	0.91			0.91	0.63
Peak-15 Minute Volume	8	49			169	10
Hourly Flow Rate, HFR	32	196			675	40
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2			2	0
Configuration		LT T			T	TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				36		48
Peak Hour Factor, PHF				0.64		0.71
Peak-15 Minute Volume				14		17
Hourly Flow Rate, HFR				56		67
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
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:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1900	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		3.0*					3.0*		3.0*
t(c,hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
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	3.0					2.3		3.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	715					857		358
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						3400		
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		358
Potential Capacity		950
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		950
Probability of Queue free St.	1.00	0.93
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows		715
Potential Capacity		1113
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1113
Probability of Queue free St.	1.00	0.97
Maj L-Shared Prob Q free St.		0.97
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows		857
Potential Capacity		877
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.91	0.97
Movement Capacity		852

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

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		

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

Step 4: LT from Minor St.	7	10

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		857
Potential Capacity		877
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.91	0.97
Movement Capacity		852

Results for Two-stage process:		
a		
y		
C t		852

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				56		67
Movement Capacity (vph)				852		950
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				852		950
Volume				56		67
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max	
C sh	
SUM C sep	
n	
C act	

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

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	32					56		67
C(m) (vph)	1113					852		950
v/c	0.03					0.07		0.07
95% queue length	0.09					0.21		0.23
Control Delay	8.3					9.5		9.1
LOS	A					A		A
Approach Delay							9.3	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1900	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
d(M,LT), Delay for stream 1 or 4	8.3	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-943 Y PR-9945

3:15 – 4:15 P M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 3:15-4:15 p m
Intersection: PR-943 y PR- 9945
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-9945
North/South Street: PR-943
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	31	246			149	27
Peak-Hour Factor, PHF	0.77	0.93			0.81	0.56
Hourly Flow Rate, HFR	40	263			183	48
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2			2	0
Configuration		LT T			T	TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				20		23
Peak Hour Factor, PHF				0.83		0.72
Hourly Flow Rate, HFR				24		32
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?						
Storage						
RT Channelized?						No
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	40					24		32
C(m) (vph)	1447					932		1044
v/c	0.03					0.03		0.03
95% queue length	0.09					0.08		0.09
Control Delay	7.6					9.0		8.6
LOS	A					A		A
Approach Delay							8.7	
Approach LOS							A	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 3:15-4:15 p m
Intersection: PR-943 y PR- 9945
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-9945
North/South Street: PR-943
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	31	246			149	27
Peak-Hour Factor, PHF	0.77	0.93			0.81	0.56
Peak-15 Minute Volume	10	66			46	12
Hourly Flow Rate, HFR	40	263			183	48
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2			2	0
Configuration	LT	T			T	TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				20		23
Peak Hour Factor, PHF				0.83		0.72
Peak-15 Minute Volume				6		8
Hourly Flow Rate, HFR				24		32
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
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:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1800	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		3.0*					3.0*		3.0*
t(c,hv)		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
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	3.0					2.3		3.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	231					418		116
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						3400		
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		116
Potential Capacity		1044
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1044
Probability of Queue free St.	1.00	0.97

Step 2: LT from Major St.	4	1
Conflicting Flows		231
Potential Capacity		1447
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1447
Probability of Queue free St.	1.00	0.97
Maj L-Shared Prob Q free St.		0.97

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		418
Potential Capacity		958
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.95	0.97
Movement Capacity		932

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

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		

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

Step 4: LT from Minor St.	7	10

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		418
Potential Capacity		958
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.95	0.97
Movement Capacity		932

Results for Two-stage process:		
a		
y		
C t		932

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				24		32
Movement Capacity (vph)				932		1044
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				932		1044
Volume				24		32
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

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

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	40					24		32
C(m) (vph)	1447					932		1044
v/c	0.03					0.03		0.03
95% queue length	0.09					0.08		0.09
Control Delay	7.6					9.0		8.6
LOS	A					A		A
Approach Delay							8.7	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1800	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
d(M,LT), Delay for stream 1 or 4	7.6	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-943 Y PR-181 (PTO. NORTE)

7:00 – 8:00 A M

CONDICIÓN EXISTENTE

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 7:00-8:00 a m
Intersection: PR-943 y PR-181 (Pto. Norte)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	78			361	125
Peak-Hour Factor, PHF	0.25	0.81			0.73	0.89
Hourly Flow Rate, HFR	20	96			491	140
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				18		14
Peak Hour Factor, PHF				0.56		0.35
Hourly Flow Rate, HFR				32		40
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	20						72	
C(m) (vph)	1166						881	
v/c	0.02						0.08	
95% queue length	0.05						0.27	
Control Delay	8.1						9.4	
LOS	A						A	
Approach Delay							9.4	
Approach LOS							A	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 7:00-8:00 a m
Intersection: PR-943 y PR-181 (Pto. Norte)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	78			361	125
Peak-Hour Factor, PHF	0.25	0.81			0.73	0.89
Peak-15 Minute Volume	5	24			123	35
Hourly Flow Rate, HFR	20	96			491	140
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				18		14
Peak Hour Factor, PHF				0.56		0.35
Peak-15 Minute Volume				8		10
Hourly Flow Rate, HFR				32		40
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
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:	96	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1900	
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)		3.0*					3.0*		3.0*
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	3.0					2.3		3.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	631					697		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						1700		
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		874
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		874
Probability of Queue free St.	1.00	0.95
Step 2: LT from Major St.	**4**	**1**
Conflicting Flows		631
Potential Capacity		1166
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1166
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.98
Step 3: TH from Minor St.	**8**	**11**
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	**7**	**10**
Conflicting Flows		697
Potential Capacity		907
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.94	0.98
Movement Capacity		891

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

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		

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

Step 4: LT from Minor St.	7	10

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

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

Part 3 - Single Stage		
Conflicting Flows		697
Potential Capacity		907
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.94	0.98
Movement Capacity		891

Results for Two-stage process:		
a		
y		
C t		891

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				32		40
Movement Capacity (vph)				891		874
Shared Lane Capacity (vph)					881	

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				891		874
Volume				32		40
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max	
C sh	881
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)	20						72	
C(m) (vph)	1166						881	
v/c	0.02						0.08	
95% queue length	0.05						0.27	
Control Delay	8.1						9.4	
LOS	A						A	
Approach Delay							9.4	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(i1), Volume for stream 2 or 5	96	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1900	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
d(M,LT), Delay for stream 1 or 4	8.1	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-943 Y PR-181 (PTO. NORTE)

2:45 –3:45 P M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 2:45-3:45 p m
Intersection: PR-943 y PR-181 (Pto. Norte)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	35	106			117	52
Peak-Hour Factor, PHF	0.88	0.63			0.61	0.68
Hourly Flow Rate, HFR	40	168			192	75
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				29		3
Peak Hour Factor, PHF				0.60		0.38
Hourly Flow Rate, HFR				47		8
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	40						55	
C(m) (vph)	1420						932	
v/c	0.03						0.06	
95% queue length	0.09						0.19	
Control Delay	7.6						9.1	
LOS	A						A	
Approach Delay							9.1	
Approach LOS							A	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 2:45-3:45 p m
Intersection: PR-943 y PR-181 (Pto. Norte)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	35	106			117	52
Peak-Hour Factor, PHF	0.88	0.63			0.61	0.68
Peak-15 Minute Volume	10	42			48	19
Hourly Flow Rate, HFR	40	168			192	75
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				29		3
Peak Hour Factor, PHF				0.60		0.38
Peak-15 Minute Volume				12		2
Hourly Flow Rate, HFR				47		8
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
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:	168	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1900	
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)		3.0*					3.0*		3.0*
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	3.0					2.3		3.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	267					478		230
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						1700		
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		230
Potential Capacity		999
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		999
Probability of Queue free St.	1.00	0.99
Step 2: LT from Major St.	4	1
Conflicting Flows		267
Potential Capacity		1420
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1420
Probability of Queue free St.	1.00	0.97
Maj L-Shared Prob Q free St.		0.97
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		478
Potential Capacity		948
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		921

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

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		

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

Step 4: LT from Minor St.	7	10

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		478
Potential Capacity		948
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		921

Results for Two-stage process:	
a	
y	
C t	921

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				47		8
Movement Capacity (vph)				921		999
Shared Lane Capacity (vph)					932	

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				921		999
Volume				47		8
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max	
C sh	932
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)	40						55	
C(m) (vph)	1420						932	
v/c	0.03						0.06	
95% queue length	0.09						0.19	
Control Delay	7.6						9.1	
LOS	A						A	
Approach Delay							9.1	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(i1), Volume for stream 2 or 5	168	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1900	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
d(M,LT), Delay for stream 1 or 4	7.6	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.2	

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-943 Y PR-181 (PTO. SUR)

7:00 – 8:00 A M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 7:00-8:00 a m
Intersection: PR-943 y PR-181 (Pto. Sur)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	25	83			374	1
Peak-Hour Factor, PHF	0.63	0.72			0.76	1.00
Hourly Flow Rate, HFR	40	116			492	1
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0		151
Peak Hour Factor, PHF				0.25		0.75
Hourly Flow Rate, HFR				0		200
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	40						200	
C(m) (vph)	1257						899	
v/c	0.03						0.22	
95% queue length	0.10						0.86	
Control Delay	8.0						10.1	
LOS	A						B	
Approach Delay							10.1	
Approach LOS							B	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 7:00-8:00 a m
Intersection: PR-943 y PR-181 (Pto. Sur)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	25	83			374	1
Peak-Hour Factor, PHF	0.63	0.72			0.76	1.00
Peak-15 Minute Volume	10	29			123	0
Hourly Flow Rate, HFR	40	116			492	1
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0		151
Peak Hour Factor, PHF				0.25		0.75
Peak-15 Minute Volume				0		50
Hourly Flow Rate, HFR				0		200
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		492
Potential Capacity		899
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		899
Probability of Queue free St.	1.00	0.78

Step 2: LT from Major St.	4	1
Conflicting Flows		493
Potential Capacity		1257
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1257
Probability of Queue free St.	1.00	0.97
Maj L-Shared Prob Q free St.		0.97

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		688
Potential Capacity		909
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.97	
Cap. Adj. factor due to Impeding mvmnt	0.76	0.97
Movement Capacity		880

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

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		

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

Step 4: LT from Minor St.	7	10

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		688
Potential Capacity		909
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.97	
Cap. Adj. factor due to Impeding mvmnt	0.76	0.97
Movement Capacity		880

Results for Two-stage process:		
a		
y		
C t		880

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				0		200
Movement Capacity (vph)				880		899
Shared Lane Capacity (vph)					899	

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				880		899
Volume				0		200
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max	
C sh	899
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)	40						200	
C(m) (vph)	1257						899	
v/c	0.03						0.22	
95% queue length	0.10						0.86	
Control Delay	8.0						10.1	
LOS	A						B	
Approach Delay							10.1	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(il), Volume for stream 2 or 5	116	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1900	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
d(M,LT), Delay for stream 1 or 4	8.0	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.3	

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-943 Y PR-181 (PTO. SUR)

2:45 – 3:45 P M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 2:45-3:45 p m
Intersection: PR-943 y PR-181 (Pto. Sur)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	139	141			120	0
Peak-Hour Factor, PHF	0.79	0.78			0.63	0.25
Hourly Flow Rate, HFR	175	179			192	0
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0		243
Peak Hour Factor, PHF				0.25		0.71
Hourly Flow Rate, HFR				0		339
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	175						339	
C(m) (vph)	1478						1014	
v/c	0.12						0.33	
95% queue length	0.40						1.50	
Control Delay	7.8						10.3	
LOS	A						B	
Approach Delay							10.3	
Approach LOS							B	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 30/01/2005
Analysis Time Period: 2:45-3:45 p m
Intersection: PR-943 y PR-181 (Pto. Sur)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	139	141			120	0
Peak-Hour Factor, PHF	0.79	0.78			0.63	0.25
Peak-15 Minute Volume	44	45			48	0
Hourly Flow Rate, HFR	175	179			192	0
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0		243
Peak Hour Factor, PHF				0.25		0.71
Peak-15 Minute Volume				0		85
Hourly Flow Rate, HFR				0		339
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
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:	179	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1900	
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)		3.0*					3.0*		3.0*
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	3.0					2.3		3.0
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	192					721		192
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						1700		
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		192
Potential Capacity		1014
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1014
Probability of Queue free St.	1.00	0.67
Step 2: LT from Major St.	4	1
Conflicting Flows		192
Potential Capacity		1478
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1478
Probability of Queue free St.	1.00	0.88
Maj L-Shared Prob Q free St.		0.87
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	0.87	0.87
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		721
Potential Capacity		903
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.87	
Maj. L, Min T Adj. Imp Factor.	0.90	
Cap. Adj. factor due to Impeding mvmnt	0.60	0.88
Movement Capacity		796

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	0.87	0.87
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		721
Potential Capacity		903
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.87	
Maj. L, Min T Adj. Imp Factor.	0.90	
Cap. Adj. factor due to Impeding mvmnt	0.60	0.88
Movement Capacity		796

Results for Two-stage process:		
a		
y		
C t		796

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				0		339
Movement Capacity (vph)				796		1014
Shared Lane Capacity (vph)					1014	

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				796		1014
Volume				0		339
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						

n max	
C sh	1014
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)	175						339	
C(m) (vph)	1478						1014	
v/c	0.12						0.33	
95% queue length	0.40						1.50	
Control Delay	7.8						10.3	
LOS	A						B	
Approach Delay							10.3	
Approach LOS							B	

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	179	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1900	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.87	
d(M,LT), Delay for stream 1 or 4	7.8	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	1.0	

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-9944 Y RAMPA PR-30

6:15 – 7:15 A M

CONDICIÓN EXISTENTE

HCS2000: Ramps and Ramp Junctions Release 4.1c

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Marcos Bandas Acosta
Agency/Co.:	Traffic Engineer Consultant
Date performed:	08/02/2005
Analysis time period:	6:15 - 7:15 a m
Freeway/dir or travel:	Este - Oeste
Junction:	PR-9944 y PR-30
Jurisdiction:	Gurabo
Analysis Year:	2004

Description: Proyecto Palacios de Gurabo - Con

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2450	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	25.0	mph
Volume on ramp	1349	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2450	1349		vph
Peak-hour factor, PHF	0.90	0.91		
Peak 15-min volume, v15	677	372		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	1.000	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	2708	1488		pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2708 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4196	4500	No
v_{R12}	4196	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 28.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.505

Space mean speed in ramp influence area, S_R = 48.4 mph

Space mean speed in outer lanes, S_O = N/A mph

Space mean speed for all vehicles, S = 48.4 mph

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-9944 Y RAMPA PR-30

4:45 – 5:45 P M

CONDICIÓN EXISTENTE

HCS2000: Ramps and Ramp Junctions Release 4.1c

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Marcos Bandas Acosta
Agency/Co.:	Traffic Engineer Consultant
Date performed:	08/02/2005
Analysis time period:	4:45 - 5:45 a m
Freeway/dir or travel:	Este - Oeste
Junction:	PR-9944 y PR-30
Jurisdiction:	Gurabo
Analysis Year:	2004

Description: Proyecto Palacios de Gurabo - Con

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2813	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	25.0	mph
Volume on ramp	787	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2813	787		vph
Peak-hour factor, PHF	0.93	0.92		
Peak 15-min volume, v15	754	214		v
Trucks and buses	1	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.995	0.995		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	3031	860		pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3031 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3891	4500	No
v_{R12}	3891	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 26.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.437	
Space mean speed in ramp influence area,	S_R = 49.3	mph
Space mean speed in outer lanes,	S_O = N/A	mph
Space mean speed for all vehicles,	S = 49.3	mph

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-941 Y PR-942

7:00 – 8:00 A M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 10/03/2005
Analysis Time Period: 7:00 - 8:00 a m
Intersection: PR-941 y PR- 942
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-941
North/South Street: PR-942
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	8	211			87	14
Peak-Hour Factor, PHF	0.67	0.89			0.73	0.58
Hourly Flow Rate, HFR	11	235			119	24
Percent Heavy Vehicles	0	--	--		--	--
Median Type	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				90		7
Peak Hour Factor, PHF				0.78		0.44
Hourly Flow Rate, HFR				115		16
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					Yes	
Storage					2	
RT Channelized?						
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)	11						131	
C(m) (vph)	1511						1078	
v/c	0.01						0.12	
95% queue length	0.02						0.41	
Control Delay	7.4						9.2	
LOS	A						A	
Approach Delay							9.2	
Approach LOS							A	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 10/03/2005
Analysis Time Period: 7:00 - 8:00 a m
Intersection: PR-941 y PR- 942
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-941
North/South Street: PR-942
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	8	211			87	14
Peak-Hour Factor, PHF	0.67	0.89			0.73	0.58
Peak-15 Minute Volume	3	59			30	6
Hourly Flow Rate, HFR	11	235			119	24
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				90		7
Peak Hour Factor, PHF				0.78		0.44
Peak-15 Minute Volume				29		4
Hourly Flow Rate, HFR				115		16
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					Yes	
Storage					2	
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:	235	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1800	
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)		3.1*					3.1*		3.2*
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	3.1*					2.4		3.2*
	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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	143					388		131
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						1700		
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		131
Potential Capacity		1030
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1030
Probability of Queue free St.	1.00	0.98

Step 2: LT from Major St.	4	1
Conflicting Flows		143
Potential Capacity		1511
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1511
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99

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

Step 4: LT from Minor St.	7	10
Conflicting Flows		388
Potential Capacity		953
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.99
Movement Capacity		946

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

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		

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

Step 4: LT from Minor St.	7	10

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

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

Part 3 - Single Stage		
Conflicting Flows		388
Potential Capacity		953
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.99
Movement Capacity		946

Results for Two-stage process:		
a		
y		
C t		946

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)				115		16
Movement Capacity (vph)				946		1030
Shared Lane Capacity (vph)					956	

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				946		1030
Volume				115		16
Delay				9.3		8.6
Q sep				0.30		0.04
Q sep +1				1.30		1.04
round (Qsep +1)				1		1

n max	1
C sh	956
SUM C sep	1078
n	2
C act	1078

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

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	11						131	
C(m) (vph)	1511						1078	
v/c	0.01						0.12	
95% queue length	0.02						0.41	
Control Delay	7.4						9.2	
LOS	A						A	
Approach Delay							9.2	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(i1), Volume for stream 2 or 5	235	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1800	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.4	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-941 Y PR-942

3:00 – 4:00 P M

CONDICIÓN EXISTENTE

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 10/03/2005
Analysis Time Period: 3:00 - 4:00 a m
Intersection: PR-941 y PR- 942
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-941
North/South Street: PR-942
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	111			166	51
Peak-Hour Factor, PHF	0.63	0.79			0.86	0.80
Hourly Flow Rate, HFR	16	139			192	64
Percent Heavy Vehicles	0	--	--		--	--
Median Type	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				35		3
Peak Hour Factor, PHF				0.88		0.25
Hourly Flow Rate, HFR				40		12
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					Yes	
Storage					2	
RT Channelized?						
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)	16						52	
C(m) (vph)	1418						1223	
v/c	0.01						0.04	
95% queue length	0.03						0.13	
Control Delay	7.6						8.9	
LOS	A						A	
Approach Delay							8.9	
Approach LOS							A	

HCS2000: Unsignalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 10/03/2005
Analysis Time Period: 3:00 - 4:00 a m
Intersection: PR-941 y PR- 942
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Existente
East/West Street: PR-941
North/South Street: PR-942
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	111			166	51
Peak-Hour Factor, PHF	0.63	0.79			0.86	0.80
Peak-15 Minute Volume	4	35			48	16
Hourly Flow Rate, HFR	16	139			192	64
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				35		3
Peak Hour Factor, PHF				0.88		0.25
Peak-15 Minute Volume				10		3
Hourly Flow Rate, HFR				40		12
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					Yes	
Storage					2	
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:	139	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1800	
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)		3.1*					3.1*		3.2*
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	3.1*					2.4		3.2*
	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) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	256					395		224
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						1700		
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		224
Potential Capacity		989
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		989
Probability of Queue free St.	1.00	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows		256
Potential Capacity		1418
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1418
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99

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

Step 4: LT from Minor St.	7	10
Conflicting Flows		395
Potential Capacity		952
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.99
Movement Capacity		941

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

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		

Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		

Result for 2 stage process:
a
y
C t

Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10

Part 1 - First Stage

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

Part 2 - Second Stage

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

Part 3 - Single Stage

Conflicting Flows		395
Potential Capacity		952
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.99
Movement Capacity		941

Results for Two-stage process:
a
y
C t 941

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				40		12
Movement Capacity (vph)				941		989
Shared Lane Capacity (vph)					952	

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				941		989
Volume				40		12
Delay				9.0		8.7
Q sep				0.10		0.03
Q sep +1				1.10		1.03
round (Qsep +1)				1		1

n max	1
C sh	952
SUM C sep	1223
n	2
C act	1223

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

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	16						52	
C(m) (vph)	1418						1223	
v/c	0.01						0.04	
95% queue length	0.03						0.13	
Control Delay	7.6						8.9	
LOS	A						A	
Approach Delay							8.9	
Approach LOS							A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(il), Volume for stream 2 or 5	139	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1800	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.6	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-181 Y PR-189

6:45 – 7:45 A M

CONDICIÓN EXISTENTE

HCS2000: Signalized Intersections Release 4.1c

Analyst: Marcos Bandas Acosta
Agency: Traffic Engineer Consultant
Date: 31/01/2005
Period: 6:45 - 7:45 a m
Project ID: Proyecto Palacios de Gurabo - Condición Existente
E/W St: PR-189

Inter.: PR-181 y PR-189
Area Type: CBD or Similar
Jurisd: Gurabo, PR
Year : 2005
N/S St: PR-181

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig		LTR		DefL	TR		L	T	R		LTR	
Volume	35	105	136	681	170	40	148	261	474	55	541	31
Lane Width		12.0		12.0	12.0		12.0	12.0	12.0		12.0	
RTOR Vol			10			10			40			10

Duration 1.00 Area Type: CBD or Similar

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left		A			NB	Left	A			
Thru		A				Thru	A			
Right		A				Right	A			
Peds						Peds				
WB Left	A	A			SB	Left		A		
Thru	A	A				Thru		A		
Right	A	A				Right		A		
Peds						Peds				
NB Right	A	A			EB	Right				
SB Right					WB	Right				
Green	25.0	25.0					25.0	45.0		
Yellow	3.0	3.0					0.0	4.0		
All Red	0.0	0.0					0.0	0.0		

Cycle Length: 130.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	448	2329	0.71	0.19	54.7	D	54.7	D
Westbound								
DefL	351	1300	2.05	0.19	1947	F		
TR	540	1665	0.54	0.41	30.3	C	1395	F
Northbound								
L	312	1624	0.72	0.19	57.3	E		
T	329	1710	1.00	0.19	148.6	F	66.5	E
R	906	1454	0.53	0.62	14.3	B		
Southbound								
LTR	1114	3217	0.70	0.35	38.6	D	38.6	D

Intersection Delay = 487.0 (sec/veh) Intersection LOS = F

HCS2000: Signalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 31/01/2005
Analysis Time Period: 6:45 - 7:45 a m
Intersection: PR-181 y PR-189
Area Type: CBD or Similar
Jurisdiction: Gurabo, PR
Analysis Year: 2005
Project ID: Proyecto Palacios de Gurabo - Condición Existente
East/West Street: PR-189 North/South Street: PR-181

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	35	105	136	681	170	40	148	261	474	55	541	31
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.73	0.88	0.83	0.95	0.71	0.59	0.66	0.80	0.91	0.69	0.81	0.86
PK 15 Vol	12	30	41	180	60	17	56	82	130	20	168	9
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900		1900	1900		1900	1900	1900		1900	
ParkExist	X			X								
NumPark	20			20								
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig		LTR		DefL	TR		L	T	R		LTR	
Lane Width		12.0		12.0	12.0		12.0	12.0	12.0		12.0	
RTOR Vol			10			10			40			10
Adj Flow		320		720	291		224	328	476		776	
%InSharedLn												
Prop LTs		0.150		1.000	0.000			0.000			0.103	
Prop RTs	0.475			0.175			0.000		1.000	0.031		
Peds Bikes	0			0			0			0		
Buses		0		0	0		0	0	0		0	
%InProtPhase				12.0								

Duration 1.00 Area Type: CBD or Similar

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		15.7			12.2			15.2			12.2	

PHASE DATA

Phase Combination		1	2	3	4			5	6	7	8
EB	Left		A			NB	Left	A			
	Thru		A				Thru	A			
	Right		A				Right	A			
	Peds						Peds				
WB	Left	A	A			SB	Left		A		
	Thru	A	A				Thru		A		
	Right	A	A				Right		A		
	Peds						Peds				
NB	Right	A	A			EB	Right				
SB	Right					WB	Right				
Green		25.0	25.0					25.0	45.0		
Yellow		3.0	3.0					0.0	4.0		
All Red		0.0	0.0					0.0	0.0		

Cycle Length: 130.0 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	35	105	136	681	170	40	148	261	474	55	541	31
PHF	0.73	0.88	0.83	0.95	0.71	0.59	0.66	0.80	0.91	0.69	0.81	0.86
Adj flow	48	120	152	720	240	51	224	328	476	80	672	24
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
Lane group		LTR		DefL	TR		L	T	R		LTR	
Adj flow		320		720	291		224	328	476		776	
Prop LTs		0.150		1.000	0.000			0.000			0.103	
Prop RTs		0.475			0.175		0.000		1.000		0.031	

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

	Eastbound		Westbound			Northbound				Southbound	
LG	LTR		DefL	TR		L	T	R		LTR	
So	1900		1900	1900		1900	1900	1900		1900	
Lanes	2	0	0	2	0	1	1	1	0	2	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	0.900		0.800	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	0.90		0.90	0.90		0.90	0.90	0.90		0.90	
fLU	0.95		1.00	1.00		1.00	1.00	1.00		0.95	
fRT	0.929			0.974			1.000	0.850		0.995	
fLT	0.858		0.950	1.000		0.950	1.000			0.995	
Sec.			0.342								
fLpb	1.000		1.000	1.000		1.000	1.000			1.000	
fRpb	1.000			1.000			1.000	1.000		1.000	
S	2329		1300	1665		1624	1710	1454		3217	
Sec.			468								

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	320	2329	0.14	0.19	448	0.71
Right							
Westbound							
Prot		250	1300	# 0.19	0.192	250	1.00
Perm		470	468	# 1.00	0.215	101	4.65
Left	DefL	720			0.19	351	2.05
Prot							
Perm							
Thru	TR	291	1665	0.17	0.41	540	0.54
Right							
Northbound							
Prot							
Perm							
Left	L	224	1624	0.14	0.19	312	0.72
Prot							
Perm							
Thru	T	328	1710	# 0.19	0.19	329	1.00
Right	R	476	1454	0.33	0.62	906	0.53
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	776	3217	# 0.24	0.35	1114	0.70
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 1.63

Total lost time per cycle, L = 7.00 sec

Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.72

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	0.71	0.19	49.2	1.000	448	0.28	5.5	0.0	54.7	D	54.7	D
Westbound												
DefL	2.05	0.19	45.1	1.000	351	0.50	1902	0.0	1947	F		
TR	0.54	0.41	29.2	1.000	540	0.14	1.1	0.0	30.3	C	1395	F
Northbound												
L	0.72	0.19	49.2	1.000	312	0.28	8.1	0.0	57.3	E		
T	1.00	0.19	52.5	1.000	329	0.50	96.2	0.0	148.6	F	66.5	E
R	0.53	0.62	13.7	1.000	906	0.13	0.6	0.0	14.3	B		
Southbound												
LTR	0.70	0.35	36.6	1.000	1114	0.26	1.9	0.0	38.6	D	38.6	D

Intersection delay = 487.0 (sec/veh) Intersection LOS = F

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Cycle length, C	130.0 sec				
Total actual green time for LT lane group, G (s)			53.0		
Effective permitted green time for LT lane group, g(s)			28.0		
Opposing effective green time, go (s)			25.0		
Number of lanes in LT lane group, N			1		
Number of lanes in opposing approach, No			2		
Adjusted LT flow rate, VLT (veh/h)			720		
Proportion of LT in LT lane group, PLT			1.000		
Proportion of LT in opposing flow, PLTo			0.15		
Adjusted opposing flow rate, Vo (veh/h)			320		
Lost time for LT lane group, tL			3.00		
Computation					
LT volume per cycle, LTC=VLTC/3600			26.00		
Opposing lane util. factor, fLUo		1.00	0.95	0.95	1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			6.08		
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]			0.81		
gq, (see Exhibit C16-4,5,6,7,8)			10.84		
gu=g-gq if gq>=gf, or = g-gf if gq<gf			17.16		
n=Max(gq-gf)/2,0)			5.42		
PTHo=1-PLTo			0.85		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]			1.00		
EL1 (refer to Exhibit C16-3)			1.79		
EL2=Max((1-Ptho**n)/Plto, 1.0)			3.90		
fmin=2(1+PL)/g or fmin=2(1+Pl)/g			0.14		
gdiff=max(gq-gf,0)			10.84		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)			0.34		
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			0.342		

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
Cycle length, C	130.0 sec				
Total actual green time for LT lane group, G (s)		25.0			
Effective permitted green time for LT lane group, g(s)		25.0			
Opposing effective green time, go (s)		53.0			
Number of lanes in LT lane group, N		2			
Number of lanes in opposing approach, No		2			
Adjusted LT flow rate, VLT (veh/h)		48			
Proportion of LT in LT lane group, PLT		0.150	0.000	0.000	0.103
Proportion of LT in opposing flow, PLTo		0.00			
Adjusted opposing flow rate, Vo (veh/h)		291			
Lost time for LT lane group, tL		3.00			
Computation					
LT volume per cycle, LTC=VLTC/3600		1.73			
Opposing lane util. factor, fLUo		1.00	0.95	0.95	1.00

Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	5.25
gf=G[exp(- a * (LTC ** b))]-tl, gf<=g	3.8
Opposing platoon ratio, Rpo (refer Exhibit 16-11)	1.00
Opposing Queue Ratio, qro=Max[1-Rpo(go/C),0]	0.59
gq, (see Exhibit C16-4,5,6,7,8)	0.00
gu=g-gq if gq>=gf, or = g-gf if gq<gf	21.24
n=Max(gq-gf)/2,0)	0.00
PTHo=1-PLTo	1.00
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	0.34
EL1 (refer to Exhibit C16-3)	1.86
EL2=Max((1-Ptho**n)/Plto, 1.0)	
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.11
gdiff=max(gq-gf,0)	0.00
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.81

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	0.858

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	130.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v			720		
v/c ratio from Capacity Worksheet, X			2.05		
Protected phase effective green interval, g (s)			25.0		
Opposing queue effective green interval, gq			10.84		
Unopposed green interval, gu			17.16		
Red time r=(C-g-gq-gu)			77.0		
Arrival rate, qa=v/(3600(max[X,1.0]))			0.10		
Protected ph. departure rate, Sp=s/3600			0.361		
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)			0.21		
XPerm			0.75		
XProt			1.10		
Case			2		
Queue at beginning of green arrow, Qa			7.51		
Queue at beginning of unsaturated green, Qu			5.70		
Residual queue, Qr			0.92		
Uniform Delay, d1			45.1		

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 487.0 sec/veh Intersection LOS F

BACK OF QUEUE WORKSHEET

	Eastbound	Westbound	Northbound	Southbound
LaneGroup	LTR	DefL TR	L T R	LTR
Init Queue	0.0	0.0 0.0	0.0 0.0 0.0	0.0
Flow Rate	168	720 291	224 328 476	408
So	1900	1900 1900	1900 1900 1900	1900
No.Lanes	0 2 0	0 2 0	1 1 1	0 2 0
SL	1225	1300 1665	1624 1710 1454	1693
LnCapacity	235	351 540	312 329 906	586
Flow Ratio	0.14	0.55 0.17	0.14 0.19 0.33	0.24
v/c Ratio	0.71	2.05 0.54	0.72 1.00 0.53	0.70
Grn Ratio	0.19	0.19 0.41	0.19 0.19 0.62	0.35

I Factor	1.000	1.000			1.000			1.000		
AT or PVG	3	3	3		3	3	3	3		
Pltn Ratio	1.00	1.00	1.00		1.00	1.00	1.00	1.00		
PF2	1.00	1.00	1.00		1.00	1.00	1.00	1.00		
Q1	5.7	26.0	6.9		7.6	11.8	9.6	12.7		
kB	0.4	0.6	0.7		0.4	0.4	0.8	0.6		
Q2	0.9	185.6		0.8		1.1	8.3	0.9		1.4
Q Average	6.6	211.6		7.7		8.6	20.1	10.5		14.1
Q Spacing	25.0	25.0	25.0		25.0	25.0	25.0	25.0		
Q Storage	300	300	300		100	500	500	300		
Q S Ratio	0.5	17.6	0.6		2.2	1.0	0.5	1.2		
70th Percentile Output:										
fB%	1.2	1.1	1.2		1.2	1.2	1.2	1.2		
BOQ	7.8	232.9		9.1		10.2	23.3	12.4		16.5
QSRatio	0.6	19.4	0.8		2.6	1.2	0.6	1.4		
85th Percentile Output:										
fB%	1.5	1.3	1.5		1.5	1.5	1.5	1.5		
BOQ	10.1	275.2		11.8		13.2	29.2	15.9		21.0
QSRatio	0.8	22.9	1.0		3.3	1.5	0.8	1.7		
90th Percentile Output:										
fB%	1.7	1.4	1.7		1.7	1.5	1.6	1.6		
BOQ	11.1	296.3		12.9		14.3	31.1	17.2		22.5
QSRatio	0.9	24.7	1.1		3.6	1.6	0.9	1.9		
95th Percentile Output:										
fB%	1.9	1.5	1.9		1.9	1.7	1.8	1.8		
BOQ	12.6	317.5		14.6		16.2	34.1	19.3		25.0
QSRatio	1.0	26.5	1.2		4.0	1.7	1.0	2.1		
98th Percentile Output:										
fB%	2.3	1.7	2.3		2.2	1.9	2.1	2.0		
BOQ	15.1	359.8		17.4		19.1	38.4	22.6		28.7
QSRatio	1.3	30.0	1.5		4.8	1.9	1.1	2.4		

ERROR MESSAGES

No errors to report.

ANÁLISIS DE CAPACIDAD

INTERSECCIÓN PR-181 Y PR-189

3:15 – 4:15 P M

CONDICIÓN EXISTENTE

HCS2000: Signalized Intersections Release 4.1c

Phone: Fax:
E-Mail:

OPERATIONAL ANALYSIS

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 31/01/2005
Analysis Time Period: 3:15 - 4:15 p m
Intersection: PR-181 Y PR-189
Area Type: CBD or Similar
Jurisdiction: Gurabo, PR
Analysis Year:
Project ID: Proyecto Palacios de Gurabo - Condición Existente

East/West Street: PR-189
North/South Street: PR-181

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	117	195	116	434	111	32	135	504	135	49	426	73
% Heavy Veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.86	0.76	0.94	0.88	0.71	0.80	0.58	0.95	0.58	0.77	0.85	0.63
PK 15 Vol	34	64	31	124	39	10	58	133	58	16	126	29
Hi Ln Vol												
% Grade		0			0			0			0	
Ideal Sat		1900		1900	1900		1900	1900	1900		1900	
ParkExist	X			X								
NumPark	20			20								
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig		LTR		DefL	TR		L	T	R		LTR	
Lane Width		12.0		12.0	12.0		12.0	12.0	12.0		12.0	
RTOR Vol			10			10			40			10
Adj Flow		505		496	183		232	532	163		668	
%InSharedLn												
Prop LTs		0.269		1.000	0.000			0.000			0.096	
Prop RTs	0.224			0.148			0.000		1.000	0.150		
Peds Bikes	0			0			0			0		
Buses		0		0	0		0	0	0		0	
%InProtPhase				12.0								

Duration 1.00 Area Type: CBD or Similar

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		15.7			12.2			15.2			12.2	

PHASE DATA

Phase Combination		1	2	3	4			5	6	7	8
EB	Left		A			NB	Left	A			
	Thru		A				Thru	A			
	Right		A				Right	A			
	Peds						Peds				
WB	Left	A	A			SB	Left		A		
	Thru	A	A				Thru		A		
	Right	A	A				Right		A		
	Peds						Peds				
NB	Right	A	A			EB	Right				
SB	Right					WB	Right				
Green		25.0	25.0					25.0	45.0		
Yellow		3.0	3.0					0.0	4.0		
All Red		0.0	0.0					0.0	0.0		

Cycle Length: 130.0 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	117	195	116	434	111	32	135	504	135	49	426	73
PHF	0.86	0.76	0.94	0.88	0.71	0.80	0.58	0.95	0.58	0.77	0.85	0.63
Adj flow	136	256	113	496	156	27	232	532	163	64	504	100
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
Lane group		LTR		DefL	TR		L	T	R		LTR	
Adj flow		505		496	183		232	532	163		668	
Prop LTs		0.269		1.000	0.000			0.000			0.096	
Prop RTs		0.224			0.148			0.000	1.000		0.150	

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

	Eastbound		Westbound			Northbound				Southbound	
LG	LTR		DefL	TR		L	T	R		LTR	
So	1900		1900	1900		1900	1900	1900		1900	
Lanes 0	2	0	0	2	0	1	1	1	0	2	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	0.900		0.800	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	0.90		0.90	0.90		0.90	0.90	0.90		0.90	
fLU	0.95		1.00	1.00		1.00	1.00	1.00		0.95	
fRT	0.966			0.978			1.000	0.850		0.978	
fLT	0.809		0.950	1.000		0.950	1.000			0.995	
Sec.			0.163								
fLpb	1.000		1.000	1.000		1.000	1.000			1.000	
fRpb	1.000			1.000			1.000	1.000		1.000	
S	2285		1300	1672		1624	1710	1454		3161	
Sec.			224								

CAPACITY AND LOS WORKSHEET

Capacity Analysis and Lane Group Capacity

Appr/ Mvmt	Lane Group	Adj Flow Rate (v)	Adj Sat Flow Rate (s)	Flow Ratio (v/s)	Green Ratio (g/C)	--Lane Group-- Capacity (c)	v/c Ratio
Eastbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	505	2285	0.22	0.19	439	1.15
Right							
Westbound							
Prot		250	1300	# 0.19	0.192	250	1.00
Perm		246	224	# 1.10	0.215	55	4.47
Left	DefL	496			0.19	305	1.63
Prot							
Perm							
Thru	TR	183	1672	0.11	0.41	448	0.41
Right							
Northbound							
Prot							
Perm							
Left	L	232	1624	0.14	0.19	312	0.74
Prot							
Perm							
Thru	T	532	1710	# 0.31	0.19	329	1.62
Right	R	163	1454	0.11	0.62	906	0.18
Southbound							
Prot							
Perm							
Left							
Prot							
Perm							
Thru	LTR	668	3161	# 0.21	0.35	1094	0.61
Right							

Sum of flow ratios for critical lane groups, Yc = Sum (v/s) = 1.81
Total lost time per cycle, L = 7.00 sec
Critical flow rate to capacity ratio, Xc = (Yc)(C)/(C-L) = 1.92

Control Delay and LOS Determination

Appr/ Lane Grp	Ratios v/c	Ratios g/C	Unf Del d1	Prog Adj Fact	Lane Grp Cap	Incremental Factor k	Incremental Del d2	Res Del d3	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound												
LTR	1.15	0.19	52.5	1.000	439	0.50	299.0	0.0	351.5	F	351.5	F
Westbound												
DefL	1.63	0.19	37.9	1.000	305	0.50	1142	0.0	1180	F		
TR	0.41	0.41	27.4	1.000	448	0.11	0.6	0.0	28.0	C	869.7	F
Northbound												
L	0.74	0.19	49.5	1.000	312	0.30	9.8	0.0	59.3	E		
T	1.62	0.19	52.5	1.000	329	0.50	1124	0.0	1177	F	692.3	F
R	0.18	0.62	10.4	1.000	906	0.11	0.1	0.0	10.5	B		
Southbound												
LTR	0.61	0.35	35.2	1.000	1094	0.20	1.0	0.0	36.2	D	36.2	D

Intersection delay = 516.0 (sec/veh) Intersection LOS = F

SUPPLEMENTAL PERMITTED LT WORKSHEET
for exclusive lefts

Input

		EB	WB	NB	SB
Cycle length, C	130.0 sec				
Total actual green time for LT lane group, G (s)			53.0		
Effective permitted green time for LT lane group, g(s)			28.0		
Opposing effective green time, go (s)			25.0		
Number of lanes in LT lane group, N			1		
Number of lanes in opposing approach, No			2		
Adjusted LT flow rate, VLT (veh/h)			496		
Proportion of LT in LT lane group, PLT			1.000		
Proportion of LT in opposing flow, PLTo			0.27		
Adjusted opposing flow rate, Vo (veh/h)			505		
Lost time for LT lane group, tL			3.00		
Computation					
LT volume per cycle, LTC=VLTC/3600			17.91		
Opposing lane util. factor, fLUo		1.00	0.95	0.95	1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)			9.60		
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]			0.81		
gq, (see Exhibit C16-4,5,6,7,8)			18.19		
gu=g-gq if gq>=gf, or = g-gf if gq<gf			9.81		
n=Max(gq-gf)/2,0)			9.10		
PTHo=1-PLTo			0.73		
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]			1.00		
EL1 (refer to Exhibit C16-3)			2.14		
EL2=Max((1-Ptho**n)/Plto, 1.0)			3.50		
fmin=2(1+PL)/g or fmin=2(1+Pl)/g			0.14		
gdiff=max(gq-gf,0)			18.19		
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)			0.16		
flt=fm=[gf/g]+[gu/g]/[1+PL(EL1-1)]+[gdiff/g]/[1+PL(EL2-1)],(fmin<=fm<=1.00)					
or flt=[fm+0.91(N-1)]/N**					
Left-turn adjustment, fLT			0.163		

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
Cycle length, C	130.0 sec				
Total actual green time for LT lane group, G (s)		25.0			
Effective permitted green time for LT lane group, g(s)		25.0			
Opposing effective green time, go (s)		53.0			
Number of lanes in LT lane group, N		2			
Number of lanes in opposing approach, No		2			
Adjusted LT flow rate, VLT (veh/h)		136			
Proportion of LT in LT lane group, PLT		0.269	0.000	0.000	0.096
Proportion of LT in opposing flow, PLTo		0.00			
Adjusted opposing flow rate, Vo (veh/h)		183			

Lost time for LT lane group, tL	3.00			
Computation				
LT volume per cycle, LTC=VLTC/3600	4.91			
Opposing lane util. factor, fLUo	1.00	0.95	0.95	1.00
Opposing flow, Volc=VoC/[3600(No)fLUo] (veh/ln/cyc)	3.30			
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]	0.59			
gq, (see Exhibit C16-4,5,6,7,8)	0.00			
gu=g-gq if gq>=gf, or = g-gf if gq<gf	25.00			
n=Max(gq-gf)/2,0)	0.00			
PTHo=1-PLTo	1.00			
PL*=PLT[1+(N-1)g/(gf+gu/EL1+4.24)]	0.62			
EL1 (refer to Exhibit C16-3)	1.67			
EL2=Max((1-Ptho**n)/Plto, 1.0)				
fmin=2(1+PL)/g or fmin=2(1+Pl)/g	0.13			
gdiff=max(gq-gf,0)	0.00			
fm=[gf/g]+[gu/g]/[1+PL(EL1-1)], (min=fmin;max=1.00)	0.71			
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	0.809			

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	130.0 sec				
Adj. LT vol from Vol Adjustment Worksheet, v			496		
v/c ratio from Capacity Worksheet, X			1.63		
Protected phase effective green interval, g (s)			25.0		
Opposing queue effective green interval, gq			18.19		
Unopposed green interval, gu			9.81		
Red time r=(C-g-gq-gu)			77.0		
Arrival rate, qa=v/(3600(max[X,1.0]))			0.08		
Protected ph. departure rate, Sp=s/3600			0.361		
Permitted ph. departure rate, Ss=s(gq+gu)/(gu*3600)			0.18		
XPerm			1.36		
XProt			0.96		
Case			3		
Queue at beginning of green arrow, Qa			7.15		
Queue at beginning of unsaturated green, Qu			1.54		
Residual queue, Qr			0.63		
Uniform Delay, d1			37.9		

DELAY/LOS WORKSHEET WITH INITIAL QUEUE

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

Intersection Delay 516.0 sec/veh Intersection LOS F

BACK OF QUEUE WORKSHEET

	Eastbound	Westbound	Northbound	Southbound
LaneGroup	LTR	DefL TR	L T R	LTR
Init Queue	0.0	0.0 0.0	0.0 0.0 0.0	0.0
Flow Rate	265	496 183	232 532 163	351
So	1900	1900 1900	1900 1900 1900	1900
No.Lanes	0 2 0	0 2 0	1 1 1	0 2 0
SL	1202	1300 1672	1624 1710 1454	1663
LnCapacity	231	305 448	312 329 906	575

Flow Ratio	0.22	0.38	0.11		0.14	0.31	0.11		0.21		
v/c Ratio	1.15	1.63	0.41		0.74	1.62	0.18		0.61		
Grn Ratio	0.19	0.19	0.41		0.19	0.19	0.62		0.35		
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	9.6	17.9	4.2		7.9	19.2	2.5		10.5		
kB	0.4	0.6	0.7		0.4	0.4	0.8		0.6		
Q2	19.4	97.0	0.5		1.2	102.6		0.2		1.0	
Q Average	29.0	114.9		4.7		9.1	121.9	2.7		11.5	
Q Spacing	25.0	25.0	25.0		25.0	25.0	25.0		25.0		
Q Storage	300	0	300		100	500	500		100		
Q S Ratio	2.4		0.4		2.3	6.1	0.1		2.9		
70th Percentile Output:											
fB%	1.1	1.1	1.2		1.2	1.1	1.2		1.2		
BOQ	33.3	127.1		5.6		10.7	134.6	3.2		13.5	
QSRatio	2.8		0.5		2.7	6.7	0.2		3.4		
85th Percentile Output:											
fB%	1.4	1.3	1.6		1.5	1.3	1.6		1.5		
BOQ	41.0	150.1		7.3		13.8	159.0	4.2		17.3	
QSRatio	3.4		0.6		3.5	8.0	0.2		4.3		
90th Percentile Output:											
fB%	1.5	1.4	1.7		1.7	1.4	1.7		1.6		
BOQ	43.3	161.0		8.1		15.0	170.7	4.7		18.6	
QSRatio	3.6		0.7		3.8	8.5	0.2		4.7		
95th Percentile Output:											
fB%	1.6	1.5	2.0		1.9	1.5	2.0		1.8		
BOQ	47.0	172.5		9.3		16.9	182.9	5.4		20.8	
QSRatio	3.9		0.8		4.2	9.1	0.3		5.2		
98th Percentile Output:											
fB%	1.8	1.7	2.4		2.2	1.7	2.5		2.1		
BOQ	52.4	195.4		11.3		20.0	207.2	6.7		24.2	
QSRatio	4.4		0.9		5.0	10.4	0.3		6.1		

ERROR MESSAGES

No errors to report.

ANÁLISIS DE CAPACIDAD

INT. PR-9945 Y ACCESO LOMAS DEL SOL

7:15 – 8:15 A M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-9945 y Lomas del Sol
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: Futura
Project ID: Proyecto Palacios de Gurabo - Condicón Futura
East/West Street: PR-9945
North/South Street: Acceso Lomas del Sol
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	501			175	43
Peak-Hour Factor, PHF	0.92	1.00			0.99	0.98
Hourly Flow Rate, HFR	0	501			175	43
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						No
Lanes	0	1			1	1
Configuration		LT			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				130		0
Peak Hour Factor, PHF				0.98		0.93
Hourly Flow Rate, HFR				131		0
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					Yes	
Storage					10	
RT Channelized?						
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)	0						131	
C(m) (vph)	1364							
v/c	0.00							
95% queue length	0.00							
Control Delay	7.6						10.9	
LOS	A							
Approach Delay							10.9	
Approach LOS							B	

ANÁLISIS DE CAPACIDAD

INT. PR-9945 Y ACCESO LOMAS DEL SOL

3:15 – 4:15 P M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 3:15-4:15 p m
Intersection: PR-9945 y Lomas del Sol
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: Futura
Project ID: Proyecto Palacios de Gurabo - Condicón Futura
East/West Street: PR-9945
North/South Street: Acceso Lomas del Sol
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	286			486	162
Peak-Hour Factor, PHF	0.92	0.99			1.00	0.99
Hourly Flow Rate, HFR	0	287			487	163
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						No
Lanes	0	1			1	1
Configuration		LT			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				83		0
Peak Hour Factor, PHF				0.99		0.93
Hourly Flow Rate, HFR				84		0
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					Yes	
Storage					10	
RT Channelized?						
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)	0						84	
C(m) (vph)	946							
v/c	0.00							
95% queue length	0.00							
Control Delay	8.8						10.8	
LOS	A							
Approach Delay							10.8	
Approach LOS							B	

ANÁLISIS DE CAPACIDAD

INT. PR-9945 Y ACCESO PALACIOS DE GURABO

7:15 – 8:15 A M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-9945 y Palacios de Gurabo
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: Futura
Project ID: Proyecto Palacios de Gurabo - Condicón Futura
East/West Street: PR-9945
North/South Street: Acceso Palacios de Gurabos
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	84	0	85	41	49
Peak-Hour Factor, PHF	0.92	1.00	0.50	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	84	0	85	41	49
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized?			No			No
Lanes	0	2	1	1	1	1
Configuration	LT	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	0	0	253	164	0	0
Peak Hour Factor, PHF	0.44	0.75	1.00	1.00	0.73	0.93
Hourly Flow Rate, HFR	0	0	253	164	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					Yes	
Storage					10	
RT Channelized?			No			
Lanes	0	1	1	1	1	0
Configuration	LT		R	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	LT	L	LT		R	L		TR
v (vph)	0	85	0		253	164		0
C(m) (vph)	1518	1526			1026	659		
v/c	0.00	0.06			0.25	0.25		
95% queue length	0.00	0.18			0.98	0.99		
Control Delay	7.4	7.5			9.7	12.3		
LOS	A	A			A	B		
Approach Delay								
Approach LOS								

ANÁLISIS DE CAPACIDAD

INT. PR-9945 Y ACCESO PALACIOS DE GURABO

3:15 – 4:15 P M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 3:15-3:15 p m
Intersection: PR-9945 y Palacios de Gurabo
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: Futura
Project ID: Proyecto Palacios de Gurabo - Condicón Futura
East/West Street: PR-9945
North/South Street: Acceso Palacios de Gurabos
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	43	0	276	58	162
Peak-Hour Factor, PHF	0.92	1.00	0.50	1.00	0.97	0.99
Hourly Flow Rate, HFR	0	43	0	276	60	163
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized?			No			No
Lanes	0	2	1	1	1	1
Configuration	LT	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	0	0	156	87	0	0
Peak Hour Factor, PHF	0.44	0.75	1.00	0.99	0.73	0.93
Hourly Flow Rate, HFR	0	0	156	87	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					Yes	
Storage					10	
RT Channelized?			No			
Lanes	0	1	1	1	1	0
Configuration	LT		R	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	LT	L	LT		R	L		TR
v (vph)	0	276	0		156	87		0
C(m) (vph)	1358	1579			1056	559		
v/c	0.00	0.17			0.15	0.16		
95% queue length	0.00	0.63			0.52	0.55		
Control Delay	7.7	7.8			9.0	12.6		
LOS	A	A			A	B		
Approach Delay								
Approach LOS								

ANÁLISIS DE CAPACIDAD

INT. PR-942 Y ACCESO PALACIOS DE GURABO

7:15 – 8:15 A M

CONDICIÓN FUTURA RUTA 3

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-942 y Acceso Palacios de Gu
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: Futura
Project ID: Proyecto Palacios de Gurabo - Condicón Futura
East/West Street: Acceso Palacios de Gurabo
North/South Street: Acceso Palacios de Gurabo
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		22	64	0	97	
Peak-Hour Factor, PHF		0.92	1.00	0.98	0.97	
Hourly Flow Rate, HFR		23	64	0	99	
Percent Heavy Vehicles		--	--	0	--	--
Median Type	Undivided					
RT Channelized?			No			
Lanes		2	1	0	2	
Configuration		T	R	LT	T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	192		0			
Peak Hour Factor, PHF	1.00		0.98			
Hourly Flow Rate, HFR	192		0			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?						
Storage						
RT Channelized?			No			
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L		R			
v (vph)		0	192		0			
C(m) (vph)		1522	930		1072			
v/c		0.00	0.21		0.00			
95% queue length		0.00	0.78		0.00			
Control Delay		7.4	9.9		8.4			
LOS		A	A		A			
Approach Delay				9.9				
Approach LOS				A				

ANÁLISIS DE CAPACIDAD

INT. PR-942 Y ACCESO PALACIOS DE GURABO

3:15 – 4:15 P M

CONDICIÓN FUTURA RUTA 3

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 3:15-415 p m
Intersection: PR-942 y Acceso Palacios de Gu
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: Futura
Project ID: Proyecto Palacios de Gurabo - Condicón Futura
East/West Street: Acceso Palacios de Gurabo
North/South Street: Acceso Palacios de Gurabo
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		61	21	0	38	
Peak-Hour Factor, PHF		1.00	0.88	0.98	0.95	
Hourly Flow Rate, HFR		61	24	0	40	
Percent Heavy Vehicles		--	--	0	--	--
Median Type	Undivided					
RT Channelized?			No			
Lanes		2	1	0	2	
Configuration		T	R	LT	T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	276		0			
Peak Hour Factor, PHF	1.00		0.98			
Hourly Flow Rate, HFR	276		0			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?						
Storage						
RT Channelized?			No			
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L		R			
v (vph)		0	276		0			
C(m) (vph)		1524	918		1044			
v/c		0.00	0.30		0.00			
95% queue length		0.00	1.28		0.00			
Control Delay		7.4	10.6		8.4			
LOS		A	B		A			
Approach Delay				10.6				
Approach LOS				B				

ANÁLISIS DE CAPACIDAD

INT. PR-9944, CONECTOR Y RAMPA PR-30

6:45 – 7:45 A M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 6:45-7:45 a m
Intersection: Conector, PR-9944 y Rampa
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: Futura
Project ID: Proyecto Palacios de Gurabo - Cond. Futura - Rutas 1 y 2
East/West Street: Conector y Rampa
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	259			204	563
Peak-Hour Factor, PHF	1.00	0.76			0.75	0.76
Hourly Flow Rate, HFR	1	340			272	744
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Raised curb					
RT Channelized?						Yes
Lanes	0	2			1	1
Configuration		LT T			T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	897	131			
Peak Hour Factor, PHF	0.83	0.76	0.76			
Hourly Flow Rate, HFR	2	1183	171			
Percent Heavy Vehicles	0	2	2			
Percent Grade (%)		2			0	
Median Storage	1					
Flared Approach: Exists?						
Storage						
RT Channelized?			Yes			
Lanes	0	2	1			
Configuration		LT T	R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT		LT	T	R			
v (vph)	1		593	591	171			
C(m) (vph)	1389		696	696	973			
v/c	0.00		0.85	0.85	0.18			
95% queue length	0.00		13.65	13.44	0.64			
Control Delay	7.6		37.2	36.7	9.5			
LOS	A		E	E	A			
Approach Delay				33.5				
Approach LOS				D				

ANÁLISIS DE CAPACIDAD

INT. PR-9944, CONECTOR Y RAMPA PR-30

3:00 – 4:00 P M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 3:00-4:00 p m
Intersection: Conector, PR-9944 y Rampa
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: Futura
Project ID: Proyecto Palacios de Gurabo - Cond. Futura - Rutas 1 Y 2
East/West Street: Conector y Rampa
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound				Southbound		
Movement	1	2	3	| 4	5	6
	L	T	R	| L	T	R
Volume	4	630			237	260
Peak-Hour Factor, PHF	1.00	0.93			0.98	0.94
Hourly Flow Rate, HFR	4	674			243	276
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Raised curb					
RT Channelized?						Yes
Lanes	0	2			1	1
Configuration		LT	T		T	R
Upstream Signal?			No		No	

Minor Street: Approach	Westbound				Eastbound		
Movement	7	8	9	| 10	11	12
	L	T	R	| L	T	R
Volume	10	620	131			
Peak Hour Factor, PHF	0.83	1.00	0.98			
Hourly Flow Rate, HFR	12	620	133			
Percent Heavy Vehicles	0	2	2			
Percent Grade (%)		2			0	
Median Storage	1					
Flared Approach: Exists?						
Storage						
RT Channelized?			Yes			
Lanes	0	2	1			
Configuration		LT	T	R		

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	| 7	8	9	| 10	11	12
Lane Config	LT		| LT	T	R	|		
v (vph)	4		322	310	133			
C(m) (vph)	1413		640	635	872			
v/c	0.00		0.50	0.49	0.15			
95% queue length	0.01		2.98	2.81	0.54			
Control Delay	7.6		16.3	16.0	9.9			
LOS	A		C	C	A			
Approach Delay				15.1				
Approach LOS				C				

ANÁLISIS DE CAPACIDAD

INT. PR-9944 Y PR-189

7:15 – 8:15 A M

CONDICIÓN FUTURA RUTAS 1 Y 2

Analyst: Marcos Bandas Acosta
Agency: Traffic Engineer Consultant
Date: 31/01/2005
Period: 7:15 - 8:15 a m
Project ID: Proyecto Palacios de Gurabo A M - Cond. Futura - Rutas 1 y 2
E/W St: PR-189

Inter.: PR-189 Y PR-9944
Area Type: CBD or Similar
Jurisd: Gurabo, PR
Year : 2005
N/S St: PR-9944

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig		LTR			LTR		L	T	R		LTR	
Volume	142	240	47	81	211	357	20	434	70	243	272	217
Lane Width		12.0			12.0		12.0	12.0	12.0		12.0	
RTOR Vol			5			5			10			10

Duration 1.00 Area Type: CBD or Similar

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	A			SB	Left		A		
Thru	A	A				Thru		A		
Right	A	A				Right		A		
Peds						Peds				
NB Right	A	A	A		EB	Right				
SB Right					WB	Right				
Green	10.0	12.0	30.0				31.0	31.0		
Yellow		4.0	4.0				4.0	4.0		
All Red	0.0	0.0	0.0				0.0	0.0		

Cycle Length: 130.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	905	2833	0.54	0.35	34.2	C	34.2	C
Westbound								
LTR	308	2688	2.73	0.17	3183	F	3183	F
Northbound								
L	387	1624	0.10	0.24	38.8	D		
T	408	1710	1.35	0.24	701.3	F	574.0	F
R	1018	1454	0.08	0.70	6.3	A		
Southbound								
LTR	726	3045	1.49	0.24	944.5	F	944.5	F

Intersection Delay = 1328 (sec/veh) Intersection LOS = F

ANÁLISIS DE CAPACIDAD

INT. PR-9944 Y PR-189

3:15 – 4:15 P M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Signalized Intersections Release 4.1c

Analyst: Marcos Bandas Acosta
Agency: Traffic Engineer Consultant
Date: 31/01/2005
Period: 4:00- 5:00 p m
Project ID: Proyecto Palacios de Gurabo A M - Cond. Futura - Rutas 1 y 2
E/W St: PR-189

Inter.: PR-189 Y PR-9944
Area Type: CBD or Similar
Jurisd: Gurabo, PR
Year : 2005
N/S St: PR-9944

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig		LTR			LTR		L	T	R		LTR	
Volume	125	225	46	121	245	328	35	316	79	229	305	193
Lane Width		12.0			12.0		12.0	12.0	12.0		12.0	
RTOR Vol			5			5			10			10

Duration 1.00 Area Type: CBD or Similar

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	A			SB	Left		A		
Thru	A	A				Thru		A		
Right	A	A				Right		A		
Peds						Peds				
NB Right	A	A	A		EB	Right				
SB Right					WB	Right				
Green	10.0	12.0	30.0				31.0	31.0		
Yellow		4.0	4.0				4.0	4.0		
All Red	0.0	0.0	0.0				0.0	0.0		

Cycle Length: 130.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	904	2833	0.50	0.35	33.4	C	33.4	C
Westbound								
LTR	316	2715	2.91	0.17	3497	F	3497	F
Northbound								
L	387	1624	0.18	0.24	39.6	D		
T	408	1710	0.99	0.24	124.5	F	93.6	F
R	1018	1454	0.10	0.70	6.3	A		
Southbound								
LTR	730	3062	1.46	0.24	890.6	F	890.6	F

Intersection Delay = 1406 (sec/veh) Intersection LOS = F

ANÁLISIS DE CAPACIDAD

INT. PR-9944 Y PR-941

7:15 – 8:15 A M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-941 y PR-9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Futura Rutas 1 y 2
East/West Street: PR-941
North/South Street: PR-9944
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	54	434	22	80	138	165
Peak-Hour Factor, PHF	0.61	0.79	0.79	0.65	0.88	0.55
Hourly Flow Rate, HFR	87	552	28	124	156	299
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2	0	0	1	0
Configuration	LT		TR	LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	86	124	28	427	237	27
Peak Hour Factor, PHF	0.69	0.48	0.70	0.69	0.77	0.45
Hourly Flow Rate, HFR	124	259	40	620	307	60
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		-5			5	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	2	0	0	2	0
Configuration	LT		TR	LT		TR

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT	LTR	LT		TR	LT		TR
v (vph)	87	124	253		169	773		213
C(m) (vph)	1257	1171	167		401	192		440
v/c	0.07	0.11	1.51		0.42	4.03		0.48
95% queue length	0.22	0.36	50.51		2.15	294.44		2.75
Control Delay	8.1	8.4			20.5			20.8
LOS	A	A	F		C	F		C
Approach Delay				615.6				
Approach LOS				F			F	

ANÁLISIS DE CAPACIDAD

INT. PR-9944 Y PR-941

3:00 – 4:00 P M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 3:00-4:0 p m
Intersection: PR-941 y PR- 9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Futura Rutas 1 y 2
East/West Street: PR-941
North/South Street: PR-9944
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	64	149	29	170	138	147
Peak-Hour Factor, PHF	0.53	0.79	0.79	0.65	0.88	0.45
Hourly Flow Rate, HFR	119	189	36	263	156	328
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2	0	0	1	0
Configuration	LT		TR	LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	96	395	29	251	123	42
Peak Hour Factor, PHF	0.69	0.73	0.70	0.34	0.35	0.33
Hourly Flow Rate, HFR	138	539	41	732	355	128
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		-5			5	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	2	0	0	2	0
Configuration	LT		TR	LT		TR

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT	LTR	LT		TR	LT		TR
v (vph)	119	263	407		310	909		305
C(m) (vph)	1236	1431	0		323	0		432
v/c	0.10	0.18			0.96			0.71
95% queue length	0.32	0.67			18.56			6.53
Control Delay	8.2	8.1			123.3			32.6
LOS	A	A	F		F	F		D
Approach Delay								
Approach LOS								

ANÁLISIS DE CAPACIDAD

INT. PR-9944 Y PR-943

7:15 – 8:15 A M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-943 y PR- 9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Futura Rutas 1 y 2
East/West Street: PR-9944
North/South Street: PR-943
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	46	0	0	133	938
Peak-Hour Factor, PHF	0.44	0.57	0.25	0.25	0.62	0.72
Hourly Flow Rate, HFR	16	80	0	0	216	1295
Percent Heavy Vehicles	0	--	--	2	--	--
Median Type	Undivided					
RT Channelized?						No
Lanes	0	1	0	0	1	1
Configuration		LTR		LT		R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	1	0	289	1	12
Peak Hour Factor, PHF	0.25	0.25	0.25	0.71	0.25	0.50
Hourly Flow Rate, HFR	0	4	0	408	4	24
Percent Heavy Vehicles	0	0	0	2	2	2
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	1	0	1	1	0
Configuration		LTR		L		TR

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LT		LTR		L		TR
v (vph)	16	0		4		408		28
C(m) (vph)	712	1555		553		887		963
v/c	0.02	0.00		0.01		0.46		0.03
95% queue length	0.07	0.00		0.02		2.53		0.09
Control Delay	10.2	7.3		11.6		12.5		8.9
LOS	B	A		B		B		A
Approach Delay				11.6			12.3	
Approach LOS				B			B	

ANÁLISIS DE CAPACIDAD

INT. PR-9944 Y PR-943

2:45 – 3:45 P M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 2:45-3:45 p m
Intersection: PR-943 y PR- 9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Futura Rutas 1 y 2
East/West Street: PR-9944
North/South Street: PR-943
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	8	77	0	0	48	390
Peak-Hour Factor, PHF	0.44	0.46	0.25	0.25	0.75	0.84
Hourly Flow Rate, HFR	18	167	0	0	64	464
Percent Heavy Vehicles	0	--	--	2	--	--
Median Type	Undivided					
RT Channelized?						No
Lanes	0	1	0	0	1	1
Configuration		LTR		LT		R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	2	1	615	2	14
Peak Hour Factor, PHF	0.25	0.25	0.25	0.68	0.25	0.50
Hourly Flow Rate, HFR	0	8	4	899	8	28
Percent Heavy Vehicles	0	0	0	2	2	2
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	1	0	1	1	0
Configuration		LTR		L		TR

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LT		LTR		L		TR
v (vph)	18	0		12		899		36
C(m) (vph)	1233	1485		1019		907		993
v/c	0.01	0.00		0.01		0.99		0.04
95% queue length	0.04	0.00		0.04		34.78		0.11
Control Delay	8.0	7.4		8.6		85.6		8.8
LOS	A	A		A		F		A
Approach Delay				8.6			82.6	
Approach LOS				A			F	

ANÁLISIS DE CAPACIDAD

INT. PR-943 Y PR-9945

7:15 – 8:15 A M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-943 y PR- 9945
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year:
Project ID: Proyecto Palacios de Gurabo - Condicón Futuro Rutas 1 y 2
East/West Street: PR-9945
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	149	178			613	69
Peak-Hour Factor, PHF	0.79	0.73			0.84	0.49
Hourly Flow Rate, HFR	188	243			732	140
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	1	1			2	0
Configuration	L	T			T	TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				173	0	458
Peak Hour Factor, PHF				0.58	0.25	0.52
Hourly Flow Rate, HFR				300	0	880
Percent Heavy Vehicles				2	0	2
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				1	1	0
Configuration				L		TR

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L					L		TR
v (vph)	188					300		880
C(m) (vph)	1279					1134		1295
v/c	0.15					0.26		0.68
95% queue length	0.52					1.08		6.18
Control Delay	8.3					9.3		13.6
LOS	A					A		B
Approach Delay							12.5	
Approach LOS							B	

ANÁLISIS DE CAPACIDAD

INT. PR-943 Y PR-9945

3:15 – 4:15 P M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 3:15-4:15 a m
Intersection: PR-943 y PR- 9945
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year:
Project ID: Proyecto Palacios de Gurabo - Condicón Futuro Rutas 1 y 2
East/West Street: PR-9945
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	470	246			149	173
Peak-Hour Factor, PHF	0.85	0.87			0.83	1.00
Hourly Flow Rate, HFR	552	284			179	173
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	1	1			2	0
Configuration	L	T			T	TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				101	0	268
Peak Hour Factor, PHF				0.72	0.25	0.77
Hourly Flow Rate, HFR				139	0	347
Percent Heavy Vehicles				2	0	2
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				1	1	0
Configuration				L		TR

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L					L		TR
v (vph)	552					139		347
C(m) (vph)	1478					816		1374
v/c	0.37					0.17		0.25
95% queue length	1.78					0.61		1.01
Control Delay	8.9					10.3		8.5
LOS	A					B		A
Approach Delay							9.0	
Approach LOS							A	

ANÁLISIS DE CAPACIDAD

INT. PR-943 Y PR-181 (PTO. NORTE)

7:00 – 8:00 A M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 7:00-8:00 a m
Intersection: PR-943 y PR-181 (Pto. Norte)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year:
Project ID: Proyecto Palacios de Gurabo - Condicón Futuro Ruta 1 y 2
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound				Southbound		
Movement	1	2	3	| 4	5	6
	L	T	R	| L	T	R
Volume	5	78			361	136
Peak-Hour Factor, PHF	0.25	0.81			0.73	0.77
Hourly Flow Rate, HFR	20	96			491	176
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound				Eastbound		
Movement	7	8	9	| 10	11	12
	L	T	R	| L	T	R
Volume				31		14
Peak Hour Factor, PHF				0.43		0.35
Hourly Flow Rate, HFR				72		40
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	| 7	8	9	| 10	11	12
Lane Config	LT		|			|	LR	
v (vph)	20						112	
C(m) (vph)	1143						881	
v/c	0.02						0.13	
95% queue length	0.05						0.44	
Control Delay	8.2						9.7	
LOS	A						A	
Approach Delay							9.7	
Approach LOS							A	

ANÁLISIS DE CAPACIDAD

INT. PR-943 Y PR-181 (PTO. NORTE)

2:45 – 3:45 P M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 2:45-3:45 p m
Intersection: PR-943 y PR-181 (Pto. Norte)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year:
Project ID: Proyecto Palacios de Gurabo - Condicón Futuro Ruta 1 y 2
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	35	106			117	97
Peak-Hour Factor, PHF	0.97	0.88			0.91	0.87
Hourly Flow Rate, HFR	36	120			128	112
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				37		3
Peak Hour Factor, PHF				0.42		0.35
Hourly Flow Rate, HFR				88		8
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	36						96	
C(m) (vph)	1428						942	
v/c	0.03						0.10	
95% queue length	0.08						0.34	
Control Delay	7.6						9.3	
LOS	A						A	
Approach Delay							9.3	
Approach LOS							A	

ANÁLISIS DE CAPACIDAD

INT. PR-943 Y PR-181 (PTO. SUR)

7:00 – 8:00 A M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 7:00-8:00 a m
Intersection: PR-943 y PR-181 (Pto. Sur)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Futuro Rutas 1 y 2
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	58	83			374	1
Peak-Hour Factor, PHF	0.58	0.65			0.76	1.00
Hourly Flow Rate, HFR	100	128			492	1
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0		275
Peak Hour Factor, PHF				0.25		0.65
Hourly Flow Rate, HFR				0		419
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	100						419	
C(m) (vph)	1257						899	
v/c	0.08						0.47	
95% queue length	0.26						2.59	
Control Delay	8.1						12.5	
LOS	A						B	
Approach Delay							12.5	
Approach LOS							B	

ANÁLISIS DE CAPACIDAD

INT. PR-943 Y PR-181 (PTO. SUR)

2:45– 3:45 P M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 2:45-3:45 p m
Intersection: PR-943 y PR-181 (Pto. Sur)
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Futuro Rutas 1 y 2
East/West Street: PR-943
North/South Street: PR-181
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	240	141			120	0
Peak-Hour Factor, PHF	0.70	1.00			0.79	0.25
Hourly Flow Rate, HFR	344	141			151	0
Percent Heavy Vehicles	0	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0		316
Peak Hour Factor, PHF				0.25		0.64
Hourly Flow Rate, HFR				0		492
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	344						492	
C(m) (vph)	1510						1030	
v/c	0.23						0.48	
95% queue length	0.88						2.72	
Control Delay	8.1						11.7	
LOS	A						B	
Approach Delay							11.7	
Approach LOS							B	

ANÁLISIS DE CAPACIDAD

INT. PR-941 Y PR-942

7:00 – 8:00 A M

CONDICIÓN FUTURA RUTAS 3

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 7:00 - 8:00 a m
Intersection: PR-941 y PR-942
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Futura Ruta 3
East/West Street: PR-941
North/South Street: PR-942
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	211			87	76
Peak-Hour Factor, PHF	0.50	0.89			0.73	0.76
Hourly Flow Rate, HFR	20	235			119	100
Percent Heavy Vehicles	0	--	--		--	--
Median Type	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				268		21
Peak Hour Factor, PHF				0.87		0.75
Hourly Flow Rate, HFR				307		28
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					Yes	
Storage					2	
RT Channelized?						
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)	20						335	
C(m) (vph)	1448						1014	
v/c	0.01						0.33	
95% queue length	0.04						1.47	
Control Delay	7.5						10.6	
LOS	A						B	
Approach Delay							10.6	
Approach LOS							B	

ANÁLISIS DE CAPACIDAD

INT. PR-941 Y PR-942

3:00 – 4:00 P M

CONDICIÓN FUTURA RUTAS 3

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 3:00 - 4:00 p m
Intersection: PR-941 y PR-942
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year:
Project ID: Proyecto Palacios de Gurabo - Condicón Futura Ruta 3
East/West Street: PR-941
North/South Street: PR-942
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	20	111			166	255
Peak-Hour Factor, PHF	0.71	0.89			0.73	0.87
Hourly Flow Rate, HFR	27	124			228	291
Percent Heavy Vehicles	1	--	--		--	--
Median Type	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				146		12
Peak Hour Factor, PHF				0.76		0.50
Hourly Flow Rate, HFR				191		24
Percent Heavy Vehicles				1		1
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					Yes	
Storage					2	
RT Channelized?						
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)	27						215	
C(m) (vph)	1217						1010	
v/c	0.02						0.21	
95% queue length	0.07						0.81	
Control Delay	8.0						10.0-	
LOS	A						A	
Approach Delay							10.0-	
Approach LOS							A	

ANÁLISIS DE CAPACIDAD

INT. PR-181 Y PR-189

6:45– 7:45 A M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Signalized Intersections Release 4.1c

Analyst: Marcos Bandas Acosta
Agency: Traffic Engineer Consultant
Date: 24/03/2005
Period: 6:45 - 7:45 a m
Project ID: Proyecto Palacios de Gurabo - Condición Futuro Rutas 1 y 2
E/W St: PR-189

Inter.: PR-181 y PR-189
Area Type: CBD or Similar
Jurisd: Gurabo, PR
Year : 2005
N/S St: PR-181

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig		LTR		DefL	TR		L	T	R		LTR	
Volume	68	105	136	681	170	43	148	286	474	66	483	37
Lane Width		12.0		12.0	12.0		12.0	12.0	12.0		12.0	
RTOR Vol			10			10			40			10

Duration 1.00 Area Type: CBD or Similar

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left		A			NB	Left	A			
Thru		A				Thru	A			
Right		A				Right	A			
Peds						Peds				
WB Left	A	A			SB	Left		A		
Thru	A	A				Thru		A		
Right	A	A				Right		A		
Peds						Peds				
NB Right	A	A			EB	Right				
SB Right					WB	Right				
Green	25.0	25.0					25.0	45.0		
Yellow	3.0	3.0					0.0	4.0		
All Red	0.0	0.0					0.0	0.0		

Cycle Length: 130.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	411	2139	0.89	0.19	76.6	E	76.6	E
Westbound								
DefL	337	1300	2.14	0.19	2101	F		
TR	517	1661	0.57	0.41	31.3	C	1498	F
Northbound								
L	312	1624	0.54	0.19	49.2	D		
T	329	1710	1.07	0.19	235.8	F	98.5	F
R	906	1454	0.53	0.62	14.3	B		
Southbound								
LTR	1108	3200	0.57	0.35	35.2	D	35.2	D

Intersection Delay = 556.1 (sec/veh) Intersection LOS = F

ANÁLISIS DE CAPACIDAD

INT. PR-181 Y PR-189

3:15– 4:15 P M

CONDICIÓN FUTURA RUTAS 1 Y 2

HCS2000: Signalized Intersections Release 4.1c

Analyst: Marcos Bandas Acosta
Agency: Traffic Engineer Consultant
Date: 24/03/2005
Period: 3:15 - 4:15 p m
Project ID: Proyecto Palacios de Gurabo - Condición Futuro Rutas 1 y 2
E/W St: PR-189

Inter.: PR-181 Y PR-189
Area Type: CBD or Similar
Jurisd: Gurabo, PR
Year :
N/S St: PR-181

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig		LTR		DefL	TR		L	T	R		LTR	
Volume	117	195	116	434	111	38	135	571	135	55	426	83
Lane Width		12.0		12.0	12.0		12.0	12.0	12.0		12.0	
RTOR Vol			10			10			40			10

Duration 1.00 Area Type: CBD or Similar

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left		A			NB	Left	A			
Thru		A				Thru	A			
Right		A				Right	A			
Peds						Peds				
WB Left	A	A			SB	Left		A		
Thru	A	A				Thru		A		
Right	A	A				Right		A		
Peds						Peds				
NB Right	A	A			EB	Right				
SB Right					WB	Right				
Green	25.0	25.0					25.0	45.0		
Yellow	3.0	3.0					0.0	4.0		
All Red	0.0	0.0					0.0	0.0		

Cycle Length: 130.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	438	2278	1.15	0.19	355.9	F	355.9	F
Westbound								
DefL	305	1300	1.63	0.19	1180	F		
TR	446	1663	0.43	0.41	28.3	C	859.9	F
Northbound								
L	312	1624	0.74	0.19	59.3	E		
T	329	1710	1.83	0.19	1563	F	960.2	F
R	906	1454	0.18	0.62	10.5	B		
Southbound								
LTR	1096	3167	0.61	0.35	36.1	D	36.1	D

Intersection Delay = 614.2 (sec/veh) Intersection LOS = F

ANÁLISIS DE CAPACIDAD

INT. PR-9944 Y PR-941

7:15– 7:15 A M

CONDICIÓN FUTURA RUTAS 1, 2 Y 3

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 7:15-8:15 a m
Intersection: PR-941 y PR- 9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Cond. Futura Rutas 1, 2 y 3
East/West Street: PR-941
North/South Street: PR-9944
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	69	589	30	80	163	165
Peak-Hour Factor, PHF	0.61	0.79	0.79	0.65	0.88	0.84
Hourly Flow Rate, HFR	112	749	38	124	184	195
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2	0	0	1	0
Configuration	LT		TR	LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	120	124	28	427	237	30
Peak Hour Factor, PHF	0.69	0.48	0.70	0.87	0.77	0.94
Hourly Flow Rate, HFR	173	259	40	491	307	32
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		-5			5	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	2	0	0	2	0
Configuration	LT		TR	LT		TR

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT	LTR	LT		TR	LT		TR
v (vph)	112	124	302		169	644		185
C(m) (vph)	1312	1039	0		347	120		344
v/c	0.09	0.12			0.49	5.37		0.54
95% queue length	0.28	0.41			2.76	265.64		3.35
Control Delay	8.0	8.9			25.1			27.5
LOS	A	A	F		D	F		D
Approach Delay								
Approach LOS							F	

ANÁLISIS DE CAPACIDAD

INT. PR-9944 Y PR-941

3:00– 4:00 P M

CONDICIÓN FUTURA RUTAS 1, 2 Y 3

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 3:00-4:0 p m
Intersection: PR-941 y PR-9944
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: 2004
Project ID: Proyecto Palacios de Gurabo - Condicón Futura Rutas 1, 2 y 3
East/West Street: PR-941
North/South Street: PR-9944
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	75	233	45	170	281	147
Peak-Hour Factor, PHF	0.53	0.79	0.79	0.65	0.88	0.45
Hourly Flow Rate, HFR	140	296	57	263	317	328
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	2	0	0	1	0
Configuration	LT		TR	LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	190	395	29	251	123	63
Peak Hour Factor, PHF	0.69	0.73	0.70	0.34	0.35	0.33
Hourly Flow Rate, HFR	273	539	41	732	355	192
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		-5			5	
Median Storage						
Flared Approach: Exists?		No			No	
Storage						
RT Channelized?						
Lanes	0	2	0	0	2	0
Configuration	LT		TR	LT		TR

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT	LTR	LT		TR	LT		TR
v (vph)	140	263	542		310	909		369
C(m) (vph)	1128	1332	0		242	0		368
v/c	0.12	0.20			1.28			1.00
95% queue length	0.42	0.74			44.46			23.78
Control Delay	8.6	8.4			586.2			150.1
LOS	A	A	F		F	F		F
Approach Delay								
Approach LOS								

ANÁLISIS DE CAPACIDAD

INT. PR-9944 Y PR-189

7:15– 8:15 A M

CONDICIÓN FUTURA RUTAS 1, 2 Y 3

HCS2000: Signalized Intersections Release 4.1c

Analyst: Marcos Bandas Acosta
Agency: Traffic Engineer Consultant
Date: 24/03/2005
Period: 7:15 - 8:15 a m
Project ID: Proyecto Palacios de Gurabo A M - Cond. Futura-Rutas 1, 2 y3
E/W St: PR-189

Inter.: PR-189 Y PR-9944
Area Type: CBD or Similar
Jurisd: Gurabo, PR
Year :
N/S St: PR-9944

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig		LTR			LTR		L	T	R		LTR	
Volume	142	240	47	81	211	357	20	434	70	243	272	217
Lane Width		12.0			12.0		12.0	12.0	12.0		12.0	
RTOR Vol			5			5			10			10

Duration 1.00 Area Type: CBD or Similar

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	A			SB	Left		A		
Thru	A	A				Thru		A		
Right	A	A				Right		A		
Peds						Peds				
NB Right	A	A	A		EB	Right				
SB Right					WB	Right				
Green	10.0	12.0	30.0				31.0	31.0		
Yellow		4.0	4.0				4.0	4.0		
All Red	0.0	0.0	0.0				0.0	0.0		

Cycle Length: 130.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LTR	905	2833	0.54	0.35	34.2	C	34.2	C
Westbound								
LTR	308	2688	2.73	0.17	3183	F	3183	F
Northbound								
L	387	1624	0.10	0.24	38.8	D		
T	408	1710	1.35	0.24	701.3	F	574.0	F
R	1018	1454	0.08	0.70	6.3	A		
Southbound								
LTR	726	3045	1.49	0.24	944.5	F	944.5	F

Intersection Delay = 1328 (sec/veh) Intersection LOS = F

ANÁLISIS DE CAPACIDAD

INT. PR-9944 Y PR-189

4:00– 5:00 P M

CONDICIÓN FUTURA RUTAS 1, 2 Y 3

HCS2000: Signalized Intersections Release 4.1c

Analyst: Marcos Bandas Acosta
Agency: Traffic Engineer Consultant
Date: 24/03/2005
Period: 4:00- 5:00 p m
Project ID: Proyecto Palacios de Gurabo A M - Cond. Futura-Rutas1, 2 y 3
E/W St: PR-189

Inter.: PR-189 Y PR-9944
Area Type: CBD or Similar
Jurisd: Gurabo, PR
Year :
N/S St: PR-9944

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	2	0	0	2	0	1	1	1	0	2	0
LGConfig	DefL	TR			LTR		L	T	R		LTR	
Volume	151	225	46	121	245	363	35	349	79	234	312	197
Lane Width	12.0	12.0			12.0		12.0	12.0	12.0		12.0	
RTOR Vol			5			5			10			10

Duration 1.00 Area Type: CBD or Similar

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	A			SB	Left		A		
Thru	A	A				Thru		A		
Right	A	A				Right		A		
Peds						Peds				
NB Right	A	A	A		EB	Right				
SB Right					WB	Right				
Green	10.0	12.0	30.0				31.0	31.0		
Yellow		4.0	4.0				4.0	4.0		
All Red	0.0	0.0	0.0				0.0	0.0		

Cycle Length: 130.0 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								
DefL	395	1300	0.40	0.26	37.6	D		
TR	488	1669	0.66	0.35	38.7	D	38.4	D
Westbound								
LTR	331	2705	2.90	0.17	3482	F	3482	F
Northbound								
L	387	1624	0.18	0.24	39.6	D		
T	408	1710	1.09	0.24	251.2	F	187.5	F
R	1018	1454	0.10	0.70	6.3	A		
Southbound								
LTR	730	3062	1.49	0.24	947.0	F	947.0	F

Intersection Delay = 1434 (sec/veh) Intersection LOS = F

ANÁLISIS DE CAPACIDAD

INT. PR-9944, CONECTOR Y RAMPA Y PR-30

6:45– 7:45 A M

CONDICIÓN FUTURA RUTAS 1, 2 Y 3

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 6:45-7:45 a m
Intersection: Conector, PR-9944 y Rampa
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: Futura
Project ID: Proyecto Palacios de Gurabo - Cond. Futura - Rutas 1, 2 y 3
East/West Street: Conector y Rampa
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	285			205	565
Peak-Hour Factor, PHF	1.00	0.93			0.98	0.94
Hourly Flow Rate, HFR	1	305			210	600
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Raised curb					
RT Channelized?						Yes
Lanes	0	2			1	1
Configuration		LT	T		T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	897	132			
Peak Hour Factor, PHF	0.83	1.00	0.98			
Hourly Flow Rate, HFR	2	897	134			
Percent Heavy Vehicles	0	2	2			
Percent Grade (%)		2			0	
Median Storage 1						
Flared Approach: Exists?						
Storage						
RT Channelized?			Yes			
Lanes	0	2	1			
Configuration		LT	T R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT		LT	T	R			
v (vph)	1		450	448	134			
C(m) (vph)	1440		714	714	984			
v/c	0.00		0.63	0.63	0.14			
95% queue length	0.00		4.93	4.87	0.47			
Control Delay	7.5		18.5	18.4	9.2			
LOS	A		C	C	A			
Approach Delay				17.3				
Approach LOS				C				

ANÁLISIS DE CAPACIDAD

INT. PR-9944, CONECTOR Y RAMPA Y PR-30

3:00– 4:00 P M

CONDICIÓN FUTURA RUTAS 1, 2 Y 3

HCS2000: Unsignalized Intersections Release 4.1c

TWO-WAY STOP CONTROL SUMMARY

Analyst: Marcos Bandas Acosta
Agency/Co.: Traffic Engineer Consultant
Date Performed: 24/03/2005
Analysis Time Period: 3:00-4:00 p m
Intersection: Conector, PR-9944 y Rampa
Jurisdiction: Gurabo, PR
Units: U. S. Customary
Analysis Year: Futura
Project ID: Proyecto Palacios de Gurabo - Cond. Futura - Rutas 1, 2 y 3
East/West Street: Conector y Rampa
North/South Street: PR-9944
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	4	630			237	260
Peak-Hour Factor, PHF	1.00	0.93			0.98	0.94
Hourly Flow Rate, HFR	4	674			243	276
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Raised curb					
RT Channelized?						Yes
Lanes	0	2			1	1
Configuration		LT T			T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10	620	131			
Peak Hour Factor, PHF	0.83	1.00	0.98			
Hourly Flow Rate, HFR	12	620	133			
Percent Heavy Vehicles	0	2	2			
Percent Grade (%)		2			0	
Median Storage	1					
Flared Approach: Exists?						
Storage						
RT Channelized?			Yes			
Lanes	0	2	1			
Configuration		LT T	R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT		LT	T	R			
v (vph)	4		322	310	133			
C(m) (vph)	1413		640	635	872			
v/c	0.00		0.50	0.49	0.15			
95% queue length	0.01		2.98	2.81	0.54			
Control Delay	7.6		16.3	16.0	9.9			
LOS	A		C	C	A			
Approach Delay				15.1				
Approach LOS				C				