Traffic Impact Study

Culebra Cargo Ramp Terminal
Culebra, Puerto Rico
October 2014

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LIST OF ACRONYMS

AADT – Annual Average Daily Traffic
ADT – Average Daily Traffic
ATC – Automatic Traffic Counts
CBD – Central Business District
EB - Eastbound
FHWA – Federal Highway Administration
HCM – Highway Capacity Manual
LOS – Level(s) of Service
LRTP – Long Range Transportation Plan
MOE – Measures of Effectiveness
MTC – Manual Traffic Counts
NB - Northbound
NHS – National Highway System
PHF – Peak Hour Factor
PHV – Peak Hour Volume
PRHTA – Puerto Rico Highway and Transportation Authority
PRPB – Puerto Rico Planning Board
SB – Southbound
TSS – Traffic Signal System
TWSC – Two-Way Stop Controlled
WB - Westbound

PROJECT DESCRIPTION

The Puerto Rico Ports Authority (PRPA) proposes improvements to the cargo ramp located at San Idelfonso in Culebra, in order to temporarily divert cargo currently arriving at the Dewey Ferry Terminal, while the cargo ramp at Dewey is repaired (Figure 1). In order to evaluate the impact that this change in logistics will have on the traffic capacity of State Road PR-250, a traffic capacity analysis was completed, the results of which are presented in this report. PR-250 is the roadway that connects Dewey with San Idelfonso and one of Culebra's main thoroughfares. PR-251 intersects PR-250 near the airport extending to the west to provide access to the airport. Both state roads are part of the tertiary highway system. The average daily traffic (ADT) of these roads is 3,300 vpd for PR-250 and 3,000 vpd for PR-251.

In order to conduct the traffic capacity analysis, an influence area was defined that includes six (6) intersections along PR-250 (Figure 2):

1. PR-250 with Pedro Márquez Street
2. PR-250 with Salisberry Street
3. PR-250 with PR-251 and Monserrate Colón Street
4. PR-250 with Resaca Street
5. PR-250 with Local Roads
6. PR-250 with Local Road

All intersections are controlled by STOP regulatory signs at the minor street. For intersections where no STOP sign was seen onsite, the analysis considered a STOP sign at the minor street for modeling purposes. The land uses surrounding the influence area include residential complexes, an airport, retail stores, restaurants, and ports.

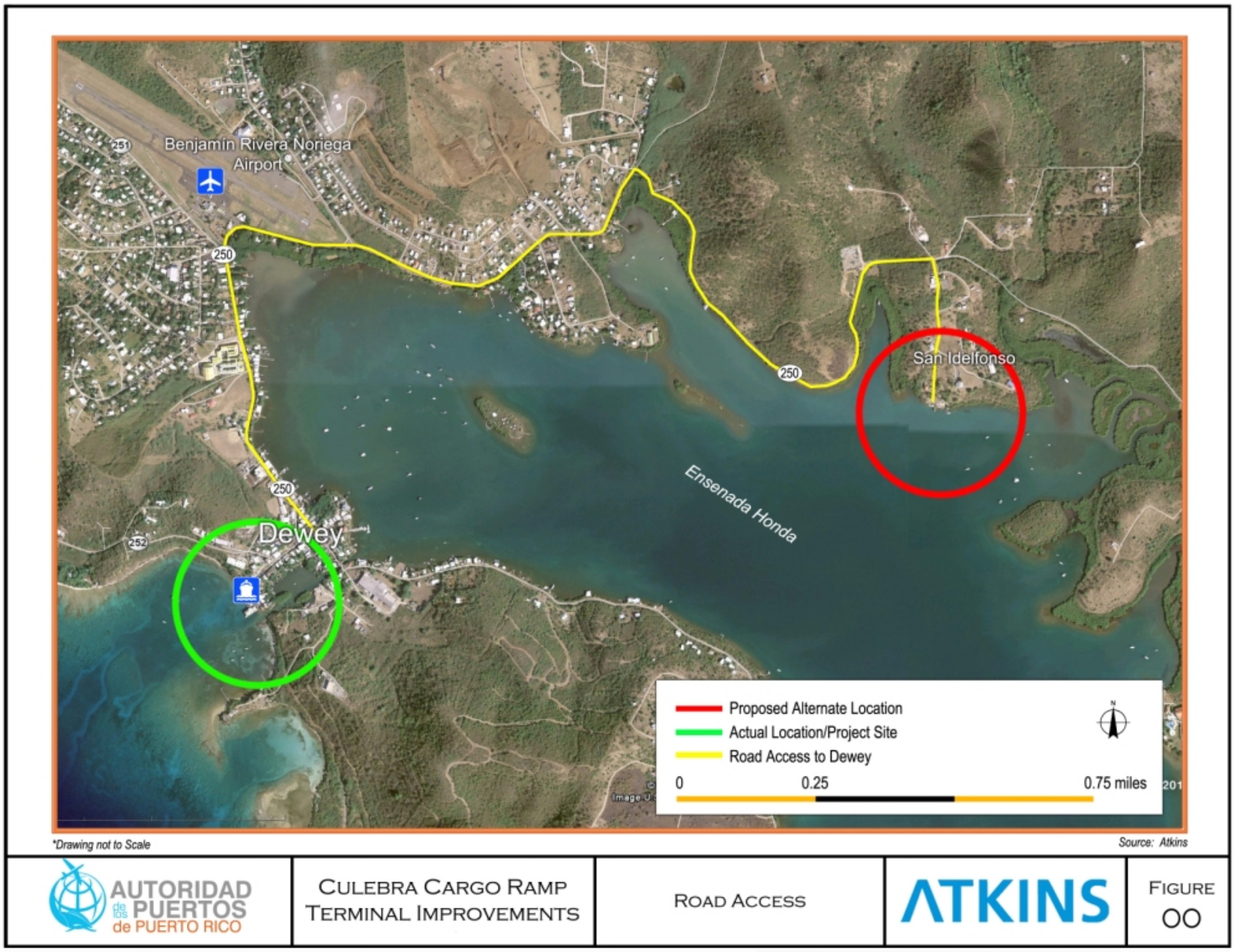


Figure 1 Location Plan

Figure 2 Influence Area

A traffic impact study was conducted in order to determine the impact that the proposed changes in traffic patterns will have on the surrounding road network. The analysis included six (6) intersections. A list of recommendations to mitigate impact is included as part of this study, following the requirements of Tables III and IV of the "*Guías para la Preparación de Estudios Operacionales de Accesos y de Tránsito para Puerto Rico*" (PRHTA 2004). The intersections analyzed in this study are:

1. PR-250 with Pedro Márquez Street - unsignalized four-leg intersection with PR-250 on the NB and SB approaches and Pedro Márquez Street on the EB and WB approaches. The NB approach is a two-way street with one shared lane (left-turn /thru/right-turn), while the SB approach only has receiving lanes. The EB approach consists of a two-way street with one shared lane (left-turn/thru/right-turn) and the WB approach is a two-way street with one shared lane (left-turn/thru/right-turn). Parallel parking is allowed on the right side of the NB approach, on the left side of the EB approach and on the right side of the WB approach. The lane width on the EB approach is approximately 3.35 meters and 2.70 meters on the EB receiving lanes. Meanwhile, the lane width on the north- and southbound approaches is approximately 3.35 meters. Pavement markings at this intersection are worn out or inexistent.

2. PR-250 with Salisberry Street - unsignalized three-way 'Y' intersection with PR-250 on the NB and SB approaches and Salisberry Street on the SB receiving lane. The NB approach is comprised of a one-way street, while the SB approach is two-way. This means that vehicles traveling SB must turn right into Salisberry Street and head southwest upon arriving at this intersection. Parallel parking is allowed on the left side of both the NB approach and Salisberry Street. The lane width on the NB/SB approaches is approximately 3.05 meters. Pavement markings at this intersection are worn out or inexistent.
3. PR-250 with PR-251 and Monserrate Colón Street – unsignalized four-leg intersection with PR-250 on the NB and WB approaches, PR-251 on the SB approach and Monserrate Colón Street on EB approach. All approaches are two-way streets with one shared lane (left-turn/thru/right-turn) each, except PR-251, which provides one shared lane (left-turn/thru) and one exclusive right-turn lane into Monserrate Colón Street. The lane width on the NB and WB approaches is approximately 3.05 meters, while on the EB approach it is approximately 3.65 meters and 3.05 meters on the SB approach. The length of the exclusive right-turn lane is approximately 13.00 meters. Pavement markings at this intersection are worn out or inexistent.
4. PR-250 with Resaca Street - unsignalized 'T' intersection with PR-250 on the EB and WB approaches and Resaca Street on the SB approach. The EB and WB approaches are two-way streets with one shared lane (left-turn /thru) on the EB approach and one shared lane (thru/right-turn) on the WB approach. Resaca Street is a two-way street with one left-turn lane and one exclusive right-turn lane. The lane width on the EB/WB approaches is approximately 3.05 meters and approximately 3.35 meters on the SB approach. The length of the exclusive right-turn lane is approximately 19.00 meters. Pavement markings at this intersection are worn out or inexistent.
5. PR-250 with Local Roads – unsignalized five-leg intersection with PR-250 on the NB and WB approaches, two roads on the SB approach (one dirt road on the right and another paved road on the left) and a paved local road on the EB approach. All approaches are two-way streets with one shared lane (left-turn, thru, right-turn) in each direction. The lane width on the NB and WB approaches is approximately 3.00 meters and 2.70 meters on the SB and EB approaches. Pavement markings at this intersection are worn out or inexistent.
6. PR-250 with Local Road - unsignalized four-leg intersection with PR-250 on the EB and WB approaches and a local road on the NB and SB approaches. All approaches are two-way streets with one shared lane (left-turn, thru, right-turn). The lane width on the EB/WB approaches is approximately 3.00 meters, 2.70 meters on the NB approach and 2.50 meters on the SB approach. Pavement markings at this intersection are worn out or inexistent.

The following tasks were completed in order to attain the study's objectives:

- Traffic counts were collected during 12-hour periods on typical weekdays during the year of the study (2014);
- Peak Hour Factors (PHF) were calculated for each movement of the intersections analyzed;

- Photos of each approach of every intersection were taken in the field;
- Maximum queue lengths were measured in the field for all approaches;
- results were analyzed; and
- conclusions and recommendations were discussed.

The following tools were used in the completion of this study:

- Highway Capacity Software 2010 (HCS2010), McTrans, University of Florida
- "*Guías para la Preparación de Estudios Operacionales de Accesos y Tránsito para Puerto Rico*," Puerto Rico Highway and Transportation Authority (PRHTA), December 2004
- Highway Capacity Manual 2010, Transportation Research Board, 2010
- Trip Generation Manual, Institute of Transportation Engineers, 9th edition, 2012
- Highway Performance Monitoring System (HPMS) Functional Classification and Federal Aid Logs
- Puerto Rico Highway Transportation Official Map, 2011
- Manual of Transportation Engineering Studies, Institute of Transportation Engineers, 2nd edition

The document was organized following the outline proposed by the PRHTA in its "*Guías para la Preparación de Estudios Operacionales de Accesos y Tránsito para Puerto Rico*."

ANALYSIS PARAMETERS

Study Area

A traffic capacity analysis was conducted in order to determine the effects that the proposed change in cargo transport logistics will have on the roadway network within the influence rea. The project consists of improvements to the cargo ramp located at San Idelfonso in Culebra, in order to temporarily divert cargo currently arriving at the Dewey Ferry Terminal, while the cargo ramp at Dewey is repaired. In order to analyze said impact, six (6) intersections were evaluated.

Scenarios Analyzed

The study includes the analysis of the existing condition in year 2014 and the condition in 2015, when the proposed changes in cargo transport logistics will be implemented.

Typical Days

The traffic counts for the study were collected on Tuesday, August 26, 2014, from 6:00 AM to 6:00 PM.

Peak Hours (AM and PM)

From the traffic counts collected during the 12-hour period, morning and afternoon peak hours were determined to be from 10:00 to 11:00 AM and from 3:45 to 3:45 PM, respectively. The tabulation of the raw data, vehicle totals, and hourly totals are included in Appendix A.

STUDY MATRIX

The names of the electronic files for each analysis performed by means of HCS2010 are included in Table 1.

Table 1 Study Matrix

Name of Electronic Files	
Existing Condition AM – int 1.xhu	Opening Year 2015 AM – int4.xhu
Existing Condition PM – int 1.xhu	Opening Year 2015 PM – int4.xhu
Existing Condition AM – int 2.xhu	Opening Year 2015 AM – int5.xhu
Existing Condition PM – int 2.xhu	Opening Year 2015 PM – int5.xhu
Existing Condition AM – int 3.xhu	Opening Year 2015 AM – int6.xhu
Existing Condition PM – int 3.xhu	Opening Year 2015 PM – int6.xhu
Existing Condition AM – int 4.xhu	Weekend 2015 AM – int1.xhu
Existing Condition PM – int 4.xhu	Weekend 2015 PM – int1.xhu
Existing Condition AM – int 5.xhu	Weekend 2015 AM – int2.xhu
Existing Condition PM – int 5.xhu	Weekend 2015 PM – int2.xhu
Existing Condition AM – int 6.xhu	Weekend 2015 AM – int3.xhu
Existing Condition PM – int 6.xhu	Weekend 2015 PM – int3.xhu
Opening Year 2015 AM – int1.xhu	Weekend 2015 AM – int4.xhu
Opening Year 2015 PM – int1.xhu	Weekend 2015 PM – int4.xhu
Opening Year 2015 AM – int2.xhu	Weekend 2015 AM – int5.xhu
Opening Year 2015 PM – int2.xhu	Weekend 2015 PM – int5.xhu
Opening Year 2015 AM – int3.xhu	Weekend 2015 AM – int6.xhu
Opening Year 2015 PM – int3.xhu	Weekend 2015 PM – int6.xhu

ANALYSIS OF EXISTING CONDITIONS (2014)

Volumes

The existing peak hour volumes (PHV) and peak hour factors (PHF) for each of the six (6) intersections analyzed are presented in Tables 2 through 7.

Table 2 Existing Condition AM (Vehicles) - PHV and PHF

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	14 (0.50)	50 (0.69)	3 (0.38)	0	0	0	96 (0.62)	5 (0.63)	8 (0.50)	0	1 (0.25)	1 (0.25)
2	19 (0.79)	133 (0.71)	0	0	6 (0.25)	133 (0.67)	0	0	0	0	0	0
3	18 (0.50)	59 (0.67)	55 (0.81)	32 (1.00)	47 (0.73)	14 (0.70)	12 (0.75)	7 (0.58)	35 (0.44)	59 (0.78)	7 (0.58)	43 (0.63)
4	0	0	0	3 (0.38)	0	27 (0.61)	24 (0.60)	66 (0.75)	0	0	76 (0.73)	12 (0.60)
5	4 (0.33)	4 (0.50)	25 (0.69)	4 (0.33)	4 (0.50)	0	0	0	5 (0.63)	26 (0.81)	2 (0.50)	4 (0.50)
6	8 (0.50)	0	1 (0.25)	1 (0.25)	1 (0.25)	1 (0.25)	1 (0.25)	16 (0.80)	7 (0.58)	1 (0.25)	24 (0.55)	0

Table 3 Existing Condition PM (Vehicles) - PHV and PHF

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	9 (0.75)	81 (0.75)	2 (0.50)	0	0	0	125 (0.74)	1 (0.25)	10 (0.83)	0	0	3 (0.38)
2	13 (0.46)	210 (0.86)	0	0	0	174 (0.87)	0	0	0	0	0	0
3	42 (0.70)	70 (0.67)	81 (0.81)	41 (0.79)	62 (0.78)	16 (0.57)	12 (0.75)	15 (0.63)	26 (0.81)	65 (0.90)	15 (0.63)	46 (0.77)
4	0	0	0	8 (0.33)	0	41 (0.85)	48 (0.67)	87 (0.81)	0	0	73 (0.63)	12 (0.60)
5	12 (0.75)	6 (0.75)	20 (0.50)	0	7 (0.44)	0	1 (0.25)	0	4 (0.50)	19 (0.68)	1 (0.25)	0
6	7 (0.58)	0	2 (0.25)	0	1 (0.25)	0	1 (0.25)	14 (0.70)	7 (0.44)	0	15 (0.75)	0

Table 4 Existing Condition AM (Heavy Vehicles) - PHV and PHF

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0	0	0	0	0	0	0	0	1	0	0	0
2	0	0	0	0	0	1 (0.25)	0	0	0	0	0	0
3	0	0	0	1 (0.25)	1 (0.25)	0	0	1 (0.25)	0	0	1 (0.25)	0
4	0	0	0	0	0	0	1 (0.25)	1 (0.25)	0	0	2 (0.25)	0
5	0	0	0	0	0	0	0	0	0	1 (0.25)	0	0
6	0	0	0	0	0	0	0	0	0	0	1 (0.25)	0

Table 5 Existing Condition PM (Heavy Vehicles) - PHV and PHF

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0	1 (0.25)	0	0	0	0	0	0	0	0	0	0
2	1 (0.25)	2 (0.25)	0	0	0	7 (0.44)	0	0	0	0	0	0
3	0	0	1 (0.25)	0	1 (0.25)	0	0	0	0	0	0	0
4	0	0	0	0	0	1 (0.25)	0	0	0	0	0	1
5	1 (0.25)	0	0	0	0	0	0	0	1 (0.25)	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0

Table 6 Existing Condition AM (Cyclists) - PHV and PHF

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0	0	0	0	0	0	0	2 (0.25)	0	0	0	2 (0.25)
2	0	4 (0.25)	0	0	0	1 (0.25)	0	0	0	0	0	0
3	0	2 (0.25)	0	0	2 (0.25)	0	1 (0.25)	0	0	0	0	0
4	0	0	0	0	0	0	1 (0.25)	1 (0.25)	0	0	2 (0.25)	0
5	0	0	1 (0.25)	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	1 (0.25)	0	0	0	0

Table 7 Existing Condition PM (Cyclists) - PHV and PHF

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	1 (0.25)	0	0	0	0	0	1 (0.25)
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0

Geometry of Intersections

The existing geometry of the six (6) intersections analyzed is presented in Figures 3 through 8. These illustrations complement the description of each intersection presented previously.

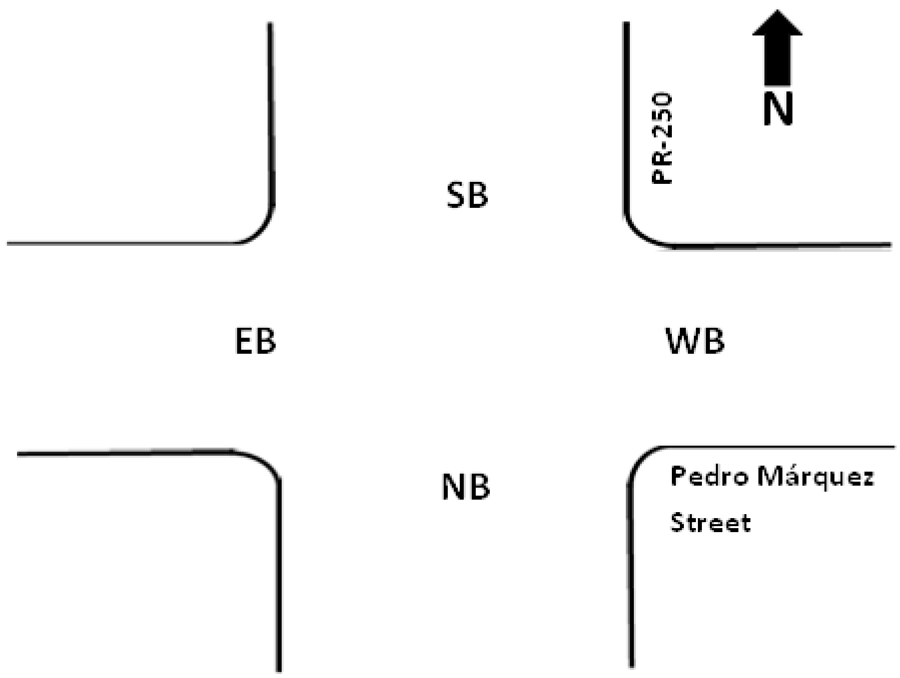


Figure 3 Existing Geometry Intersection 1

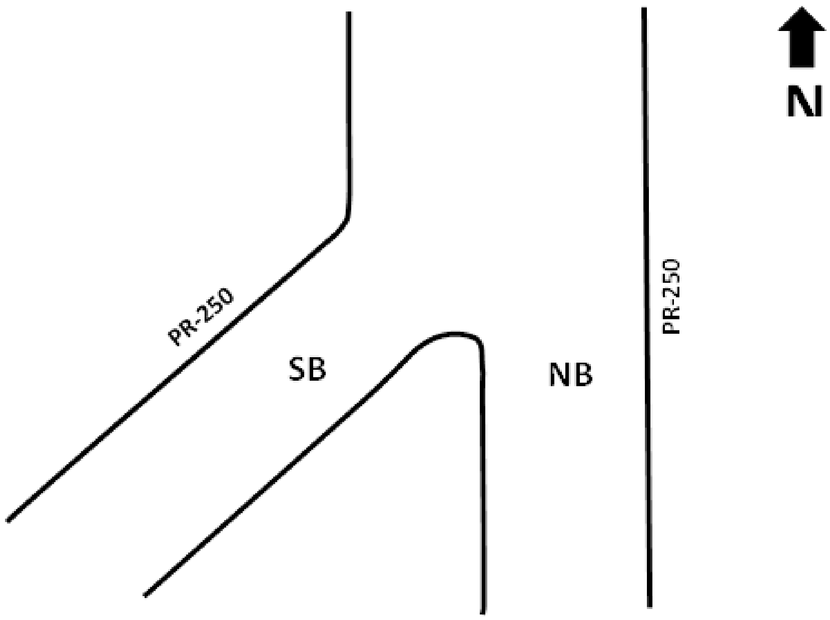


Figure 4 Existing Geometry Intersection 2

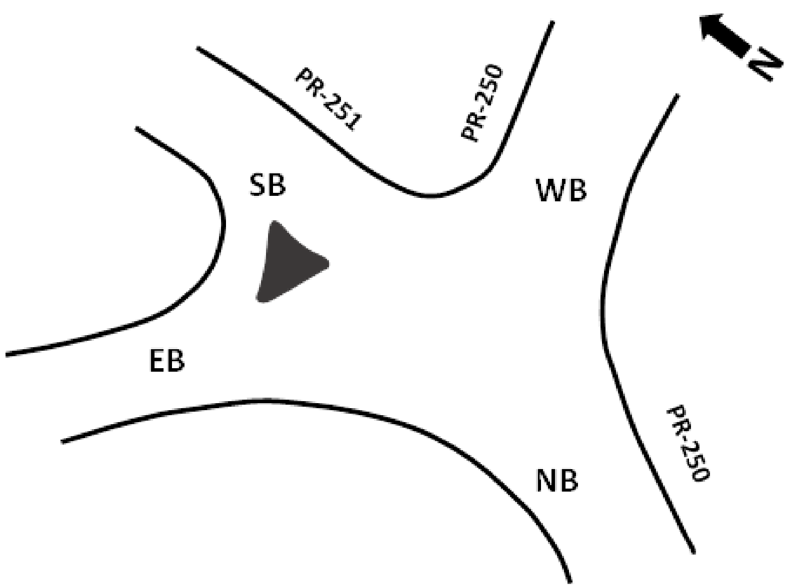


Figure 5 Existing Geometry Intersection 3

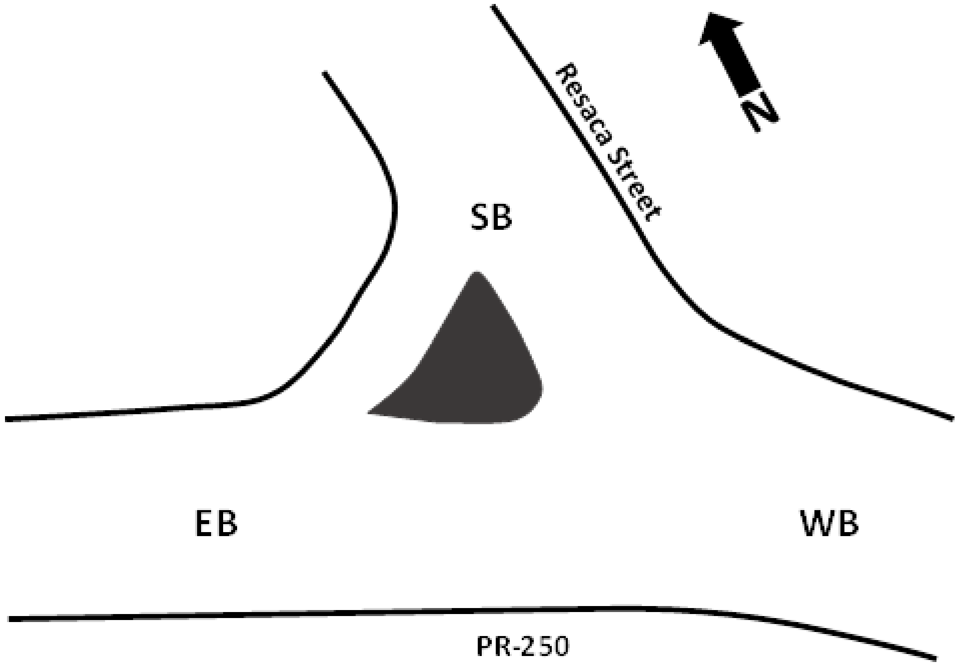


Figure 6 Existing Geometry Intersection 4

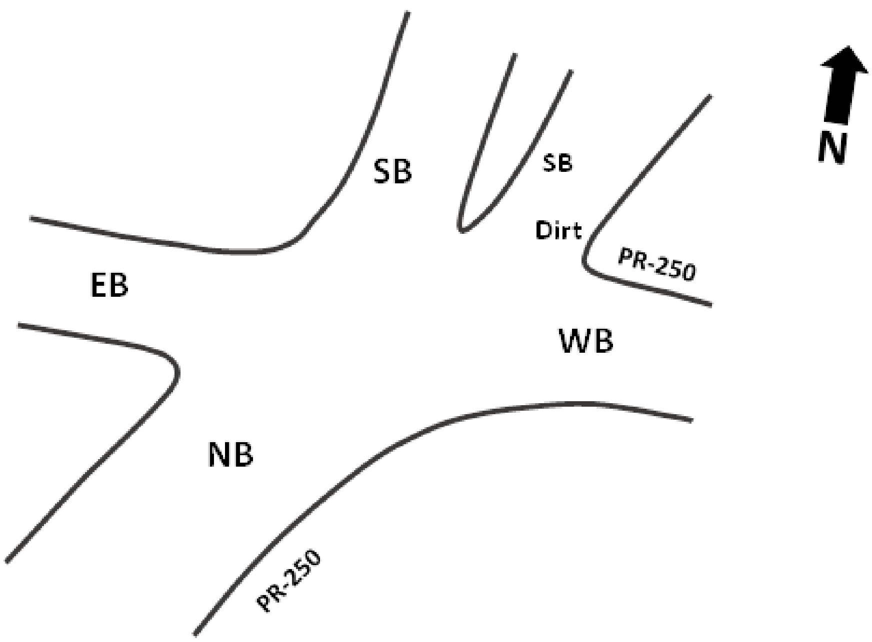


Figure 7 Existing Geometry Intersection 5

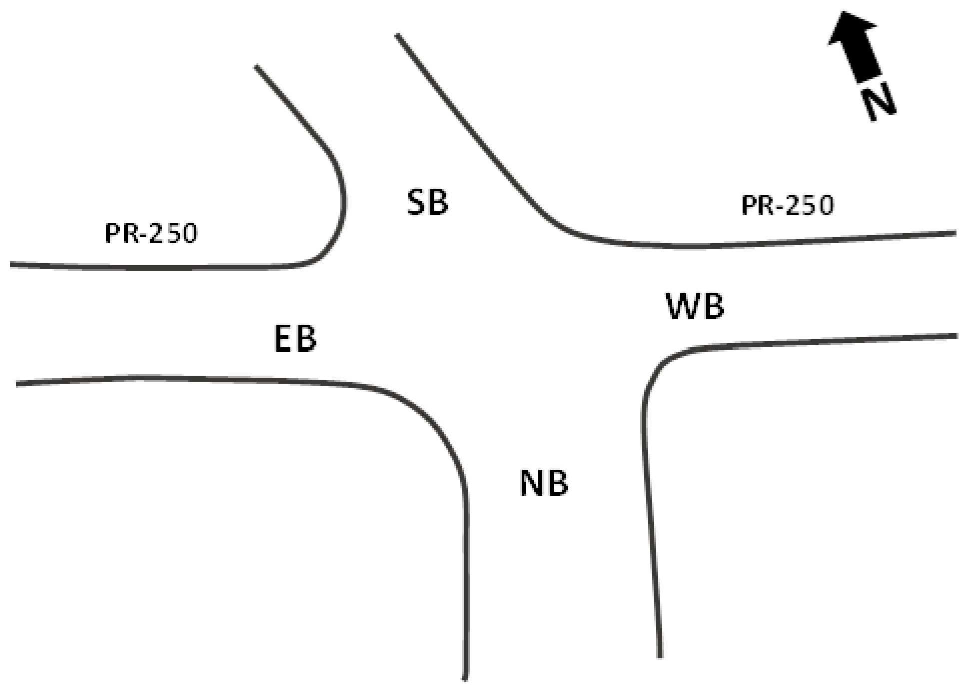


Figure 8 Existing Geometry Intersection 6

Control of Intersections

The existing traffic control of intersections 1 through 6 is shown in Figures 9 through 14. In summary, intersections 1 and 3 through 6 are Two Way Stop Controlled (TWSC). Even if a STOP regulatory sign was not physically located in the field, a stop condition was assumed on the minor road for modelling purposes. For example, on intersection 3, the eastbound approach does not have a STOP sign in place and intersections 5 and 6 do not include any regulatory signs for the control of the intersection.

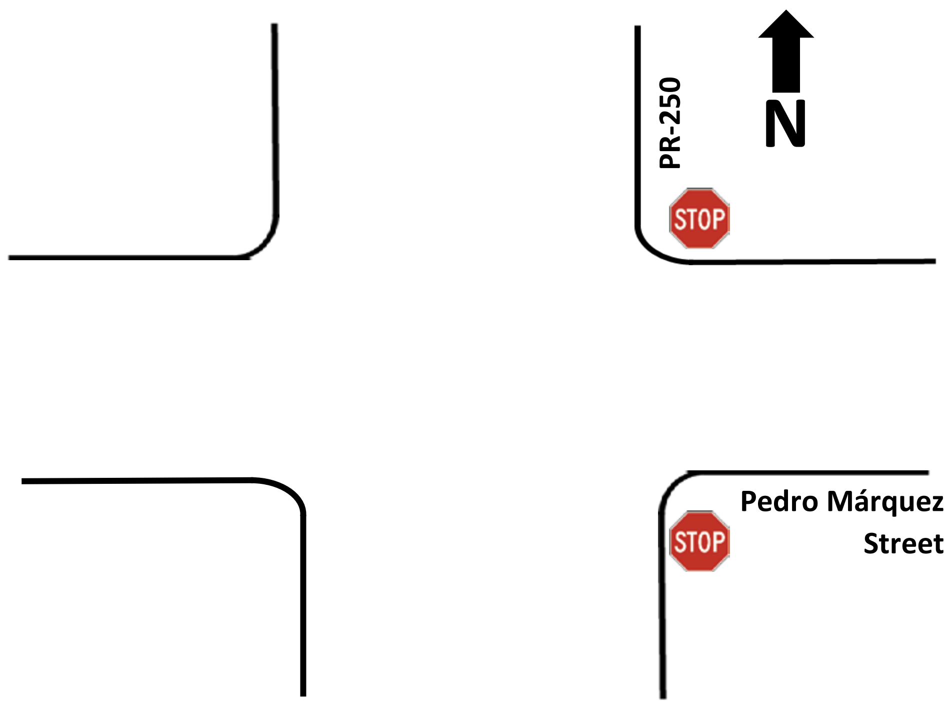


Figure 9 Existing Control for Intersection 1

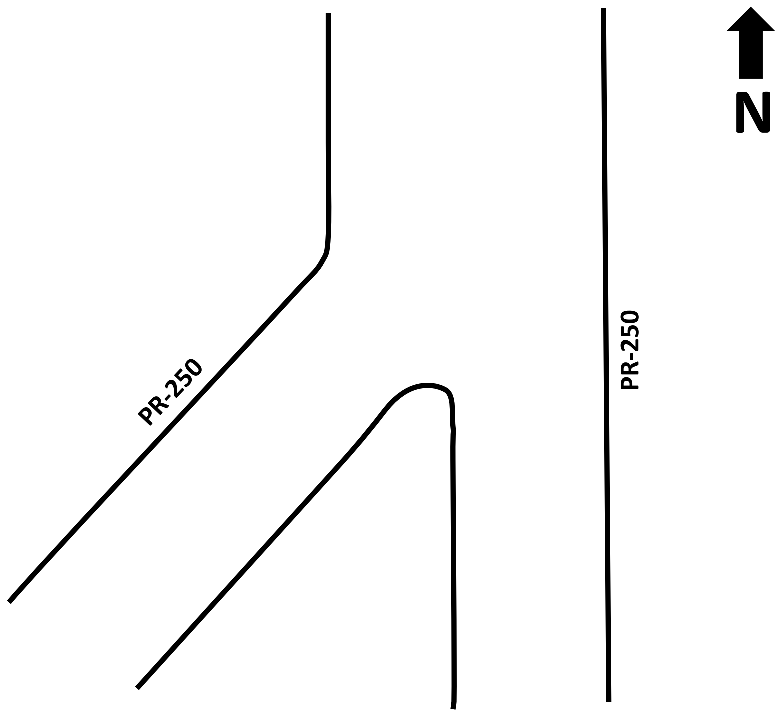


Figure 10 Existing Control for Intersection 2

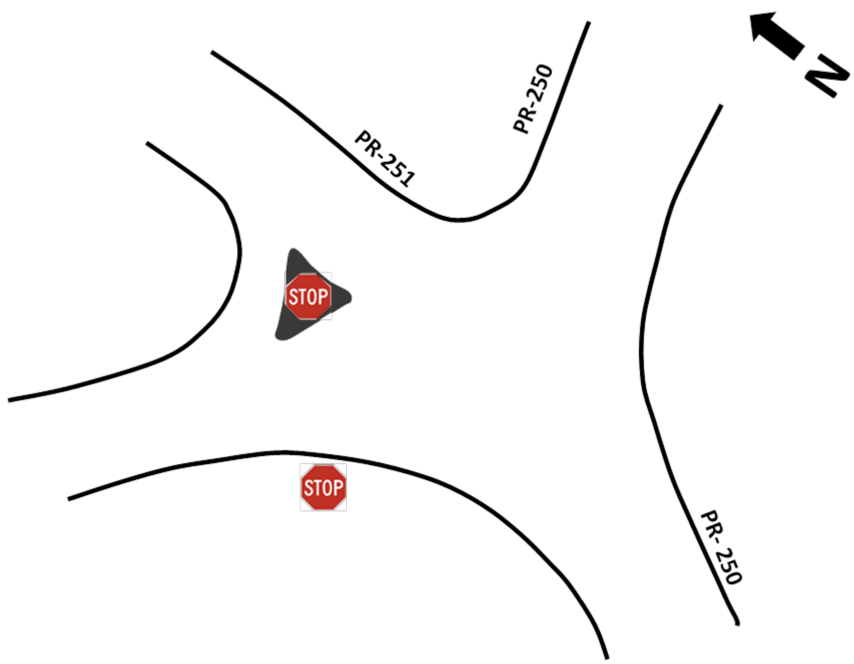


Figure 11 Existing Control for Intersection 3

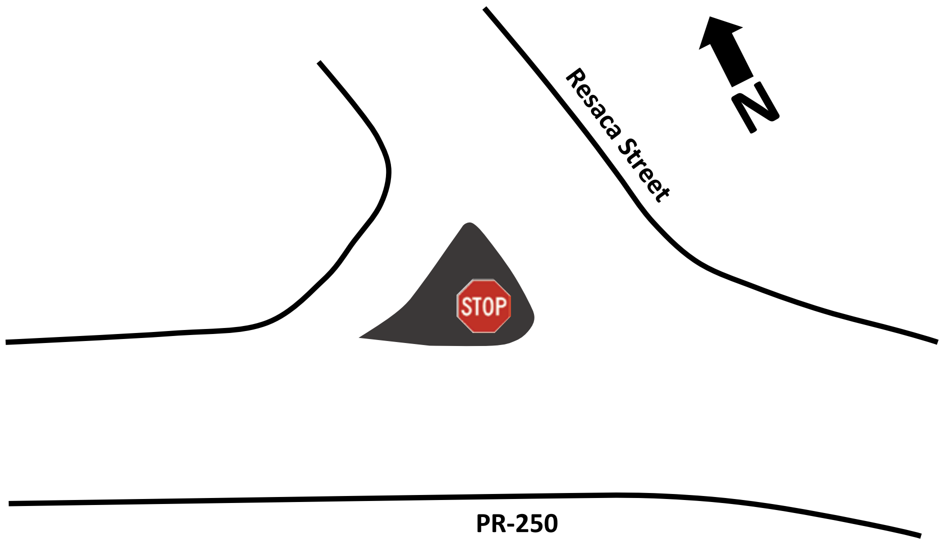


Figure 12 Existing Control for Intersection 4

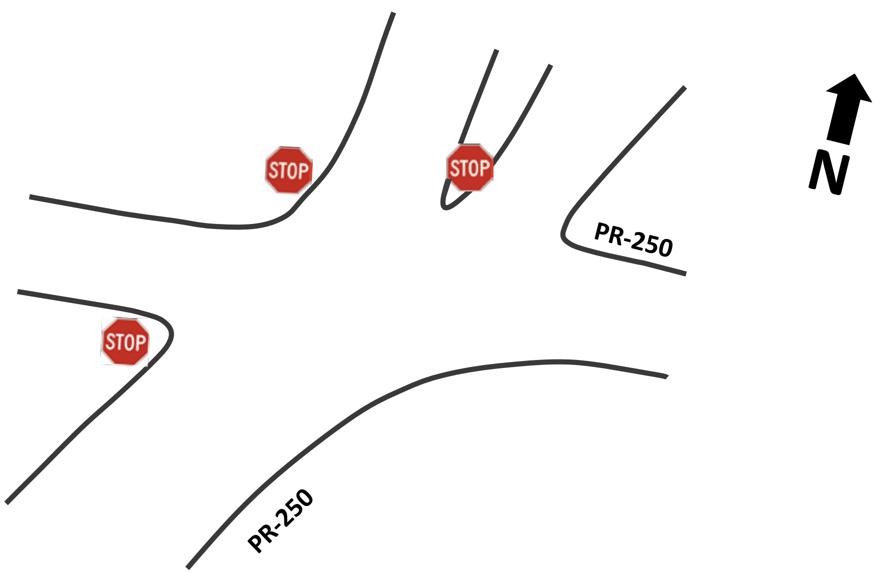


Figure 13 Existing Control for Intersection 5

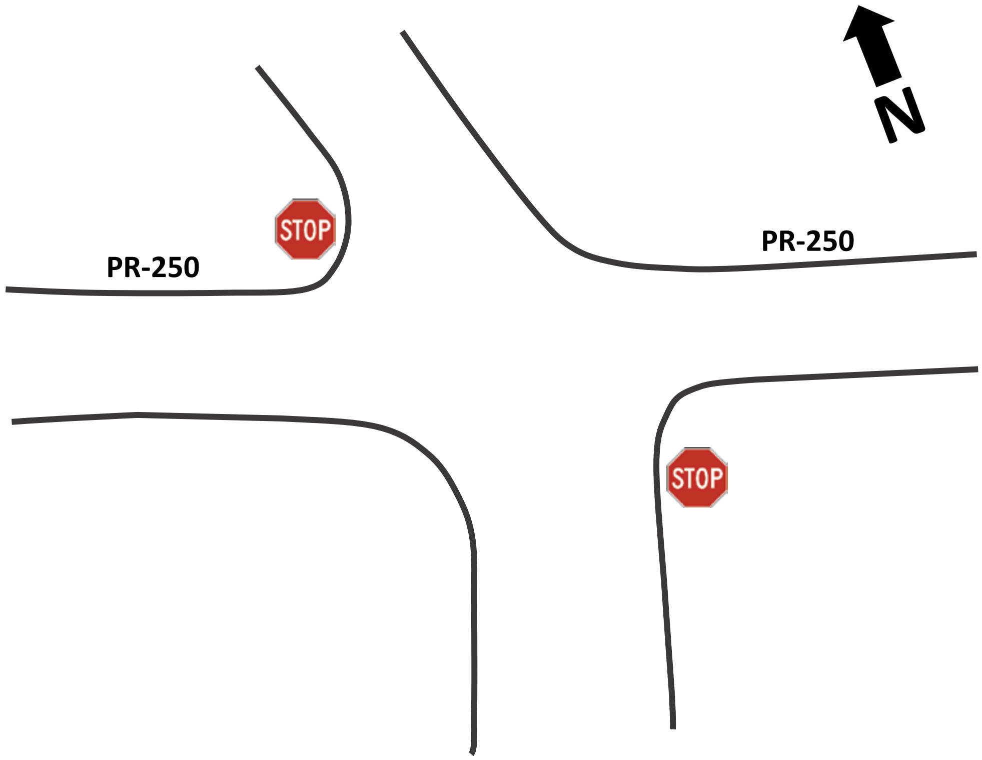
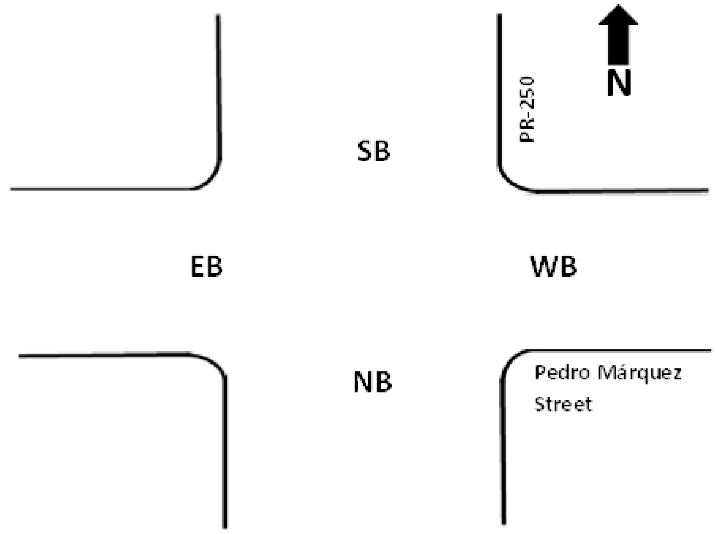


Figure 14 Existing Control for Intersection 6

Capacity Analysis of Intersections

The summary of results for the influence area's traffic capacity analysis includes the following performance measures for each intersection: v/C ratios, 95% queue length, control delay per movement, LOS per movement, control delay per approach, LOS per approach, control delay per intersection, and LOS per intersection. Tables 8 through 13 present the summary of results for the AM and PM peak hours for each intersection in year 2014.

Table 8 Summary of Results – Intersection 1 (2014)



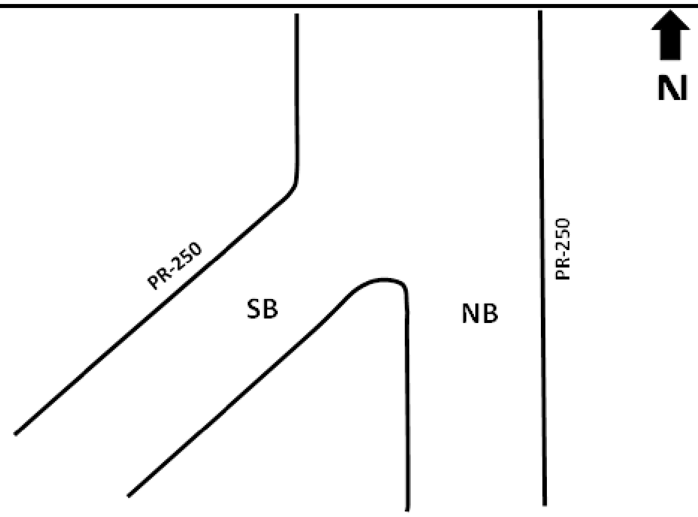
AM

Direction	EB	WB	NB	SB
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.21	0.01	0.02	---
95% Queue Length	0.81	0.03	0.05	---
Movement Control Delay (sec/veh)	10.5	9.3	7.2	---
LOS	B	A	A	---
Approach Control Delay/LOS	10.5/B	9.3/A	---	---
Intersection Delay (sec/veh)/LOS	10.0 / A			

PM

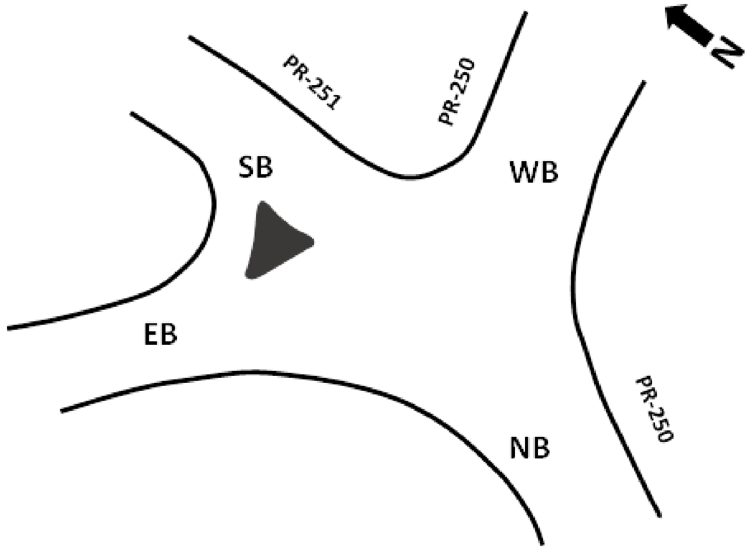
Direction	EB	WB	NB	SB
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.19	0.01	0.01	---
95% Queue Length	0.69	0.02	0.02	---
Movement Control Delay (sec/veh)	9.5	8.3	7.2	---
LOS	A	A	A	---
Approach Control Delay/LOS	9.5/A	8.3/A	---	---
Intersection Delay (sec/veh)/LOS	10.2/B			

Table 9 Summary of Results – Intersection 2 (2014)



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	---	---	0.02	---
95% Queue Length	---	---	0.05	---
Movement Control Delay (sec/veh)	---	---	7.6	---
LOS	---	---	A	---
Approach Control Delay/LOS	---	---	---	---
Intersection Delay (sec/veh)/LOS	7.6/ A			
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	---	---	0.02	---
95% Queue Length	---	---	0.07	---
Movement Control Delay (sec/veh)	---	---	7.8	---
LOS	---	---	A	---
Approach Control Delay/LOS	---	---	---	---
Intersection Delay (sec/veh)/LOS	7.8/A			

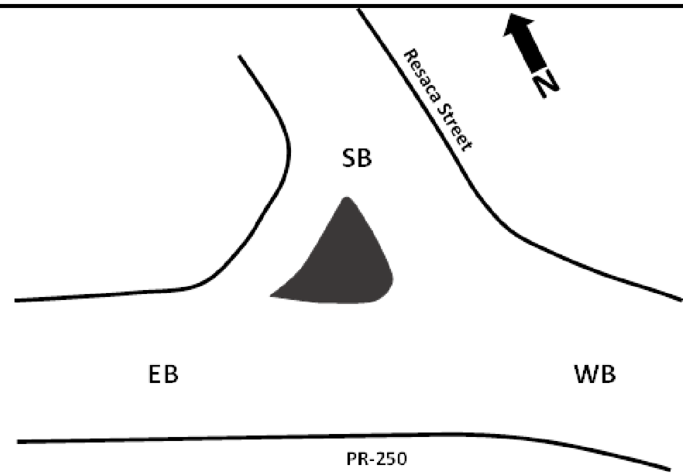
Table 10 Summary of Results – Intersection 3 (2014)



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.14	0.24	0.02	0.02
95% Queue Length	0.47	0.96	0.07	0.07
Movement Control Delay (sec/veh)	10.2	12.5	7.4	7.6
LOS	B	B	A	A
Approach Control Delay/LOS	9.7/B	12.5/B	---	---
Intersection Delay (sec/veh)/LOS	10.2/B			

PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.11	0.26	0.04	0.04
95% Queue Length	0.38	1.04	0.12	0.12
Movement Control Delay (sec/veh)	11.5	13.3	7.3	7.7
LOS	B	B	A	A
Approach Control Delay/LOS	11.5/B	13.3/B	---	---
Intersection Delay (sec/veh)/LOS	11.0/B			

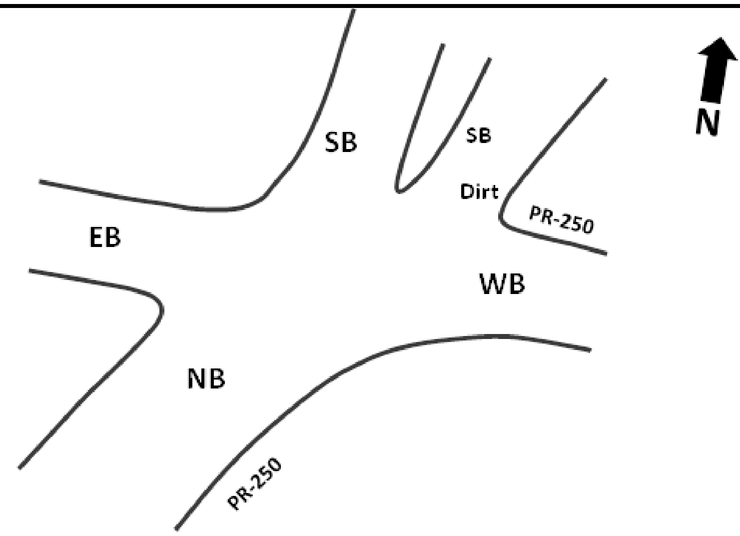
Table 11 Summary of Results – Intersection 4 (2014)



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.03	---	---	0.06
95% Queue Length	0.09	---	---	0.18
Movement Control Delay (sec/veh)	7.6	---	---	9.3
LOS	A	---	---	A
Approach Control Delay/LOS	---	---	---	9.3/A
Intersection Delay (sec/veh)/LOS	8.5/A			

PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.05	---	---	0.09
95% Queue Length	0.15	---	---	0.31
Movement Control Delay (sec/veh)	7.6	---	---	10.1
LOS	A	---	---	B
Approach Control Delay/LOS	---	---	---	10.1/B
Intersection Delay (sec/veh)/LOS	8.9/A			

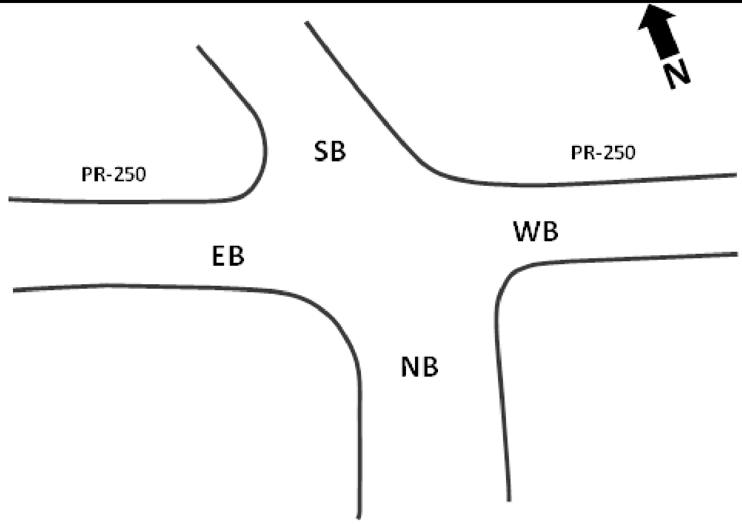
Table 12 Summary of Results – Intersection 5 (2014)



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.00	0.02	0.06	0.03
95% Queue Length	0.00	0.06	0.20	0.09
Movement Control Delay (sec/veh)	7.2	7.3	9.0	9.6
LOS	A	A	A	A
Approach Control Delay/LOS	---	---	9.0/A	9.6/A
Intersection Delay (sec/veh)/LOS	8.6 /A			

PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.00	0.02	0.07	0.04
95% Queue Length	0.01	0.05	0.24	0.11
Movement Control Delay (sec/veh)	7.2	7.3	9.0	9.7
LOS	A	A	A	A
Approach Control Delay/LOS	---	---	9.0/A	9.7/A
Intersection Delay (sec/veh)/LOS	8.7/A			

Table 13 Summary of Results – Intersection 6 (2014)



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.00	0.00	0.02	0.01
95% Queue Length	0.01	0.01	0.07	0.04
Movement Control Delay (sec/veh)	7.3	7.3	8.9	9.0
LOS	A	A	A	A
Approach Control Delay/LOS	---	---	8.9/A	9.0/A
Intersection Delay (sec/veh)/LOS	8.6/A			
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.00	0.00	0.02	0.00
95% Queue Length	0.01	0.00	0.06	0.01
Movement Control Delay (sec/veh)	7.2	7.3	8.7	9.4
LOS	A	A	A	A
Approach Control Delay/LOS	---	---	8.7/A	9.4/A
Intersection Delay (sec/veh)/LOS	8.6/A			

Overall the influence area currently operates at free-flow speed (LOS A), except for intersection 3, which operates at free-flow speed but with some traffic stream restrictions (LOS B). The current operation is considered to be good given the geometric and traffic control conditions. All approaches operate well with LOS B or better during both peak hours of the day. These ideal conditions are due to the following factors:

- Low traffic volume – the project site is located in Culebra, an island with an area of 11.6 square miles and a population of about 1,818 as per the 2010 Census. The ADT of the principal rural arterial (PR-250) is 3,300 vpd. Even during the data collection process, our counters noticed that the same vehicles passed the intersections several times.
- TWSC intersections – all intersections are two-way stop controlled, which forces traffic on the minor roads to stop for oncoming traffic on the main roads. However, with the low volumes the gaps are longer on the main roads and vehicles on the minor roads spend little time on the stop condition.
- Local traffic – since the project site is located in a very small island with no real Central Business District (CBD), traffic is local, which means that everyone knows the roadway network very well.

The graph in Figure 15 illustrates average peak hour volume versus time. The graph includes the average peak hour traffic for all six intersections evaluated. It is relevant to notice that there is a sharp peak at mid-morning, between 10:00 AM and 11:00 AM, and various peaks during the afternoon, with the largest afternoon peak being from about 3:45 PM to 4:45 PM. The graph also shows the average peak hour volume along the influence area, which is about 72 vph.

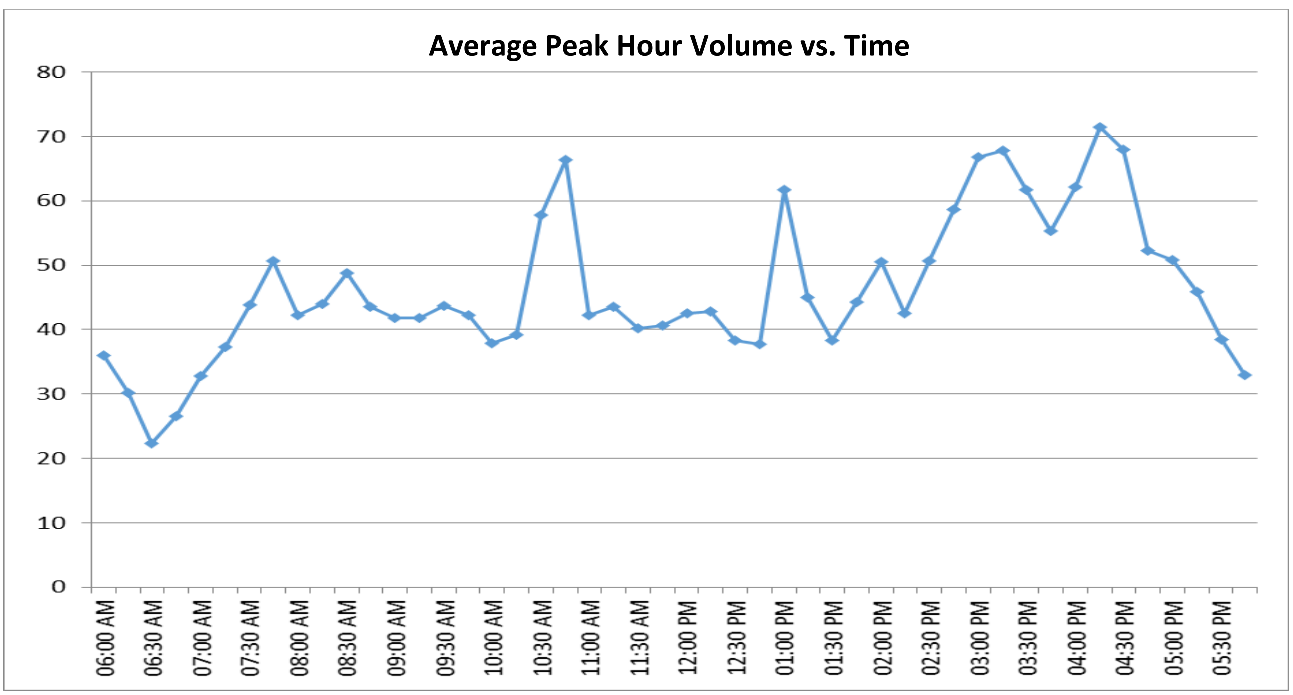


Figure 15 Peak Hour Volume versus Time - Existing Condition

The use of bicycles is a common means of transportation in Culebra. Therefore, they were considered as part of the analysis. Cyclists were counted at all six intersections. The percentage of cyclists per movement on each intersection is as follows:

Intersection 1:
AM
EB (thru) = 29%
WB (right) = 67%

Intersection 2:
AM
NB (thru) = 2%
SB (right) = 1%

Intersection 3:
AM
NB (thru) = 3%
SB (thru) = 4%
EB (left) = 8%

Intersection 4:
AM
EB (left) = 4%
EB (thru) = 1%
WB (thru) = 3%

PM
SB (right) = 2%
WB (right) = 7%

Intersection 5:
AM
NB (right) = 4%

Intersection 6:
AM
EB (thru) = 6%

Movements not shown above did not have any cyclists passing during the data collection process. The high percent of cyclists at intersection 1 means a very low volume of vehicles for those movements (refer to Tables 2 through 7).

OPENING YEAR CONDITION (2015)

Volumes

The traffic capacity analysis for year 2015 (opening year) includes traffic volume projections considering the change in traffic entering and exiting via the new cargo ramp terminal located at San Idelfonso.

Projections

The traffic growth projection for the influence area was based on a growth rate of 1.30 (20-year projection), as provided by the PRHTA's Office of Data Collection and Analysis. Considering the demographic tendencies in Puerto Rico, this growth rate is high, but it was used as a conservative value in order to account for any projects proposed in Culebra. The average traffic growth rate was calculated using Equation 1 (*F/P, i%, n*).

Equation 1 $F = P\,(1 + i)^n$

where:

F = Future AADT
P = Present AADT
i = traffic growth rate
n = number of years in analysis

Tables 14 through 17 illustrate the distribution of the peak hour volumes (PHV) and peak hour factors (PHF) during the future condition (opening year 2015), both for vehicles and heavy vehicles, considering the relocation of the cargo terminal to San Idelfonso.

Table 14 Distribution of Peak Hour Volumes and Peak Hour Factors AM (Vehicles)

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0 (0.50)	1 (0.69)	0 (0.38)	0	0	0	1 (0.62)	0 (0.63)	0 (0.50)	0	0 (0.25)	0 (0.25)
2	0 (0.79)	2 (0.71)	0	0	0 (0.25)	2 (0.67)	0	0	0	0	0	0
3	0 (0.50)	1 (0.67)	1 (0.81)	0 (1.00)	1 (0.73)	0 (0.70)	0 (0.75)	0 (0.58)	0 (0.44)	1 (0.78)	0 (0.58)	1 (0.63)
4	0	0	0	0 (0.38)	0	0 (0.61)	0 (0.60)	1 (0.75)	0	0	1 (0.73)	0 (0.60)
5	0 (0.33)	0 (0.50)	0 (0.69)	0 (0.33)	0 (0.50)	0	0	0	0 (0.63)	0 (0.81)	0 (0.50)	0 (0.50)
6	0 (0.50)	0	0 (0.25)	0 (0.25)	0 (0.25)	0 (0.25)	0 (0.25)	0 (0.80)	0 (0.58)	0 (0.25)	0 (0.55)	0

Table 15 Distribution of Peak Hour Volumes and Peak Hour Factors PM (Vehicles)

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0 (0.75)	1 (0.75)	0 (0.50)	0	0	0	2 (0.74)	0 (0.25)	0 (0.83)	0	0	0 (0.38)
2	0 (0.46)	3 (0.86)	0	0	0	2 (0.87)	0	0	0	0	0	0
3	1 (0.70)	1 (0.67)	1 (0.81)	1 (0.79)	1 (0.78)	0 (0.57)	0 (0.75)	0 (0.63)	0 (0.81)	1 (0.90)	0 (0.63)	1 (0.77)
4	0	0	0	0 (0.33)	0	1 (0.85)	1 (0.67)	1 (0.81)	0	0	1 (0.63)	0 (0.60)
5	0 (0.75)	0 (0.75)	0 (0.50)	0	0 (0.44)	0	0 (0.25)	0	0 (0.50)	0 (0.68)	0 (0.25)	0
6	0 (0.58)	0	0 (0.25)	0	0 (0.25)	0	0 (0.25)	0 (0.70)	0 (0.44)	0	0 (0.75)	0

Table 16 Distribution of Peak Hour Volumes and Peak Hour Factors AM (Heavy Vehicles)

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0	0	0	0	0	0	0	0	1	0	0	0
2	0	0	0	0	0	0 (0.25)	0	0	0	0	0	0
3	0	0	0	0 (0.25)	0 (0.25)	0	0	0 (0.25)	0	0	0 (0.25)	0
4	0	0	0	0	0	0	0 (0.25)	0(0.25)	0	0	0 (0.25)	0
5	0	0 (0.25)	0	0	0	0	0	0	0	0 (0.25)	0	0
6	0	0	0	0	0	0	0	0	0	0	0 (0.25)	0

Table 17 Distribution of Peak Hour Volumes and Peak Hour Factors PM (Heavy Vehicles)

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0	0 (0.25)	0	0	0	0	0	0	0	0	0	0
2	0 (0.25)	0 (0.25)	0	0	0	0 (0.44)	0	0	0	0	0	0
3	0	0	0 (0.25)	0	0 (0.25)	0	0	0	0	0	0	0
4	0	0	0	0	0	0 (0.25)	0	0	0	0	0	0 (0.25)
5	0 (0.25)	0	0	0	0	0	0	0	0 (0.25)	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0

Tables 18 through 23 illustrate the projection of the peak hour volumes (PHV) and peak hour factors (PHF) for the future condition (opening year 2015) for vehicles, heavy vehicles, and cyclists. They include the distributed volumes shown in Tables 10 through 13.

Table 18 Opening Year 2015 Peak Hour Volumes and Peak Hour Factors AM (Vehicles)

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	7 (0.50)	51 (0.69)	3 (0.38)	0	0	0	48 (0.62)	5 (0.63)	8 (0.50)	0	1 (0.25)	1 (0.25)
2	19 (0.79)	67 (0.71)	0	0	6 (0.25)	67 (0.67)	0	0	0	0	0	0
3	18 (0.50)	60 (0.67)	56 (0.81)	32 (1.00)	48 (0.73)	14 (0.70)	12 (0.75)	7 (0.58)	35 (0.44)	60 (0.78)	7 (0.58)	56 (0.63)
4	0	0	0	3 (0.38)	0	27 (0.61)	24 (0.60)	67 (0.75)	0	0	89 (0.73)	24 (0.60)
5	4 (0.33)	4 (0.50)	25 (0.69)	4 (0.33)	4 (0.50)	0	0	0	5 (0.63)	50 (0.81)	26 (0.50)	4 (0.50)
6	56 (0.50)	0	1 (0.25)	1 (0.25)	1 (0.25)	1 (0.25)	1 (0.25)	16 (0.80)	74 (0.58)	8 (0.25)	24 (0.55)	0

Table 19 Opening Year 2015 Peak Hour Volumes and Peak Hour Factors PM (Vehicles)

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	4 (0.75)	82 (0.75)	2 (0.50)	0	0	0	63 (0.74)	1 (0.25)	10 (0.83)	0	0	3 (0.38)
2	13 (0.46)	106 (0.86)	0	0	0	88 (0.87)	0	0	0	0	0	0
3	43 (0.70)	71 (0.67)	82 (0.81)	42 (0.79)	63 (0.78)	16 (0.57)	12 (0.75)	15 (0.63)	26 (0.81)	66 (0.90)	15 (0.63)	64 (0.77)
4	0	0	0	8 (0.33)	0	42 (0.85)	48 (0.67)	87 (0.81)	0	0	91 (0.63)	29 (0.60)
5	12 (0.75)	6 (0.75)	20 (0.50)	0	7 (0.44)	0	1 (0.25)	0	4 (0.50)	54 (0.68)	36 (0.25)	0
6	70 (0.58)	0	2 (0.25)	0	1 (0.25)	0	1 (0.25)	14 (0.70)	95 (0.44)	63 (0.90)	15 (0.75)	0

Table 20 Opening Year 2015 Peak Hour Volumes and Peak Hour Factors AM (Heavy Vehicles)

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0	0	0	0	0	0	0	0	1 (0.25)	0	0	0
2	0	1 (0.25)	0	0	0	0	0	0	0	0	0	0
3	0	0	0	2 (0.25)	0	0	0	1 (0.25)	0	0	1 (0.25)	0
4	0	0	0	0	0	0	1 (0.25)	1 (0.25)	0	0	2 (0.25)	0
5	0	0	0	0	0	0	0	0	0	1 (0.25)	0	0
6	0	0	0	0	0	0	0	0	0	1 (0.25)	0	0

Table 21 Opening Year 2015 Peak Hour Volumes and Peak Hour Factors PM (Heavy Vehicles)

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	3 (0.25)	0	0	0	0	0	0	0	0	0	0
3	0	0	1 (0.25)	1 (0.25)	0	0	0	0	0	0	0	0
4	0	0	0	1 (0.25)	0	0	0	0	0	0	0	1 (0.25)
5	0	0	1 (0.25)	0	0	0	0	1 (0.25)	0	0	0	0
6	1 (0.25)	0	0	0	0	0	0	0	7 (0.44)	0	0	0

Table 22 Opening Year 2015 Peak Hour Volumes and Peak Hour Factors AM (Cyclists)

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0	0	0	0	0	0	0	2 (0.25)	0	0	0	2 (0.25)
2	0	4 (0.25)	0	0	0	1 (0.25)	0	0	0	0	0	0
3	0	2 (0.25)	0	0	2 (0.25)	0	1 (0.25)	0	0	0	0	0
4	0	0	0	0	0	0	1 (0.25)	1 (0.25)	0	0	2 (0.25)	0
5	0	0	1 (0.25)	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	1 (0.25)	0	0	0	0

Table 23 Opening Year 2015 Peak Hour Volumes and Peak Hour Factors PM (Cyclists)

Intersection Number	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
	PHV(PHF)			PHV(PHF)			PHV(PHF)			PHV(PHF)		
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	1 (0.25)	0	0	0	0	0	1 (0.25)
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0

Geometry of Intersections

The geometry of all six intersections will remain unchanged. A description of the existing intersection's geometry is presented earlier in this document.

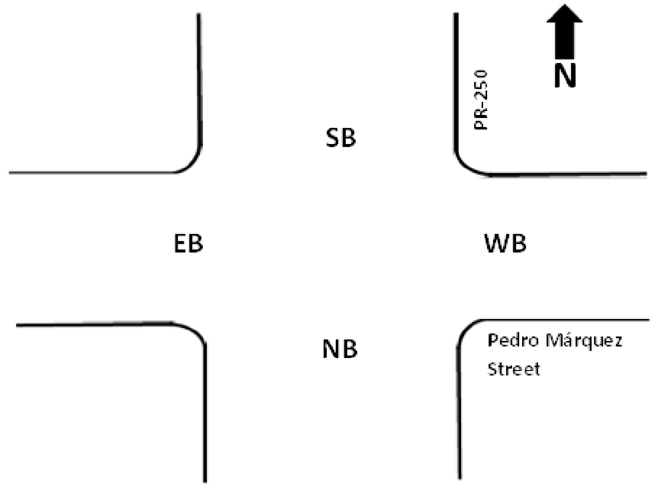
Control of Intersections

The traffic control of all intersections will remain unchanged. However, it is recommended that, where they do not currently exist, STOP regulatory signs are installed on the minor streets' approaches (refer to Figures 9 through 14).

Capacity Analysis of Intersections

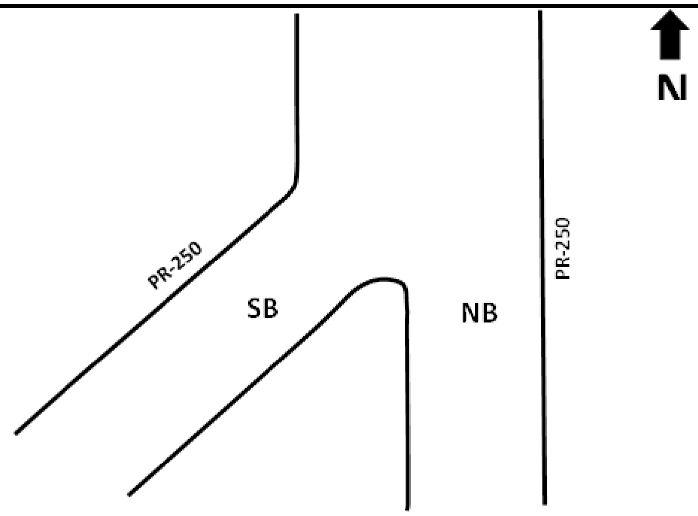
The summary of results for the influence area's traffic capacity analysis includes the following performance measures: v/C ratios, 95% queue length, control delay per movement, LOS per movement, control delay per approach, LOS per approach, control delay per intersection, and LOS per intersection. Tables 24 through 29 present the summary of results for each intersection during the AM and PM peak hours in year 2015.

Table 24 Summary of Results – Intersection 1 (2015)



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.12	0.01	0.01	---
95% Queue Length	0.39	0.03	0.03	---
Movement Control Delay (sec/veh)	9.6	9.2	7.2	---
LOS	A	A	A	---
Approach Control Delay/LOS	9.6/A	9.2/A	---	---
Intersection Delay (sec/veh)/LOS	9.3/A			
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.12	0.01	0.00	---
95% Queue Length	0.39	0.02	0.01	---
Movement Control Delay (sec/veh)	9.7	8.8	7.2	---
LOS	A	A	A	---
Approach Control Delay/LOS	9.7/A	8.8/A	---	---
Intersection Delay (sec/veh)/LOS	9.5/A			

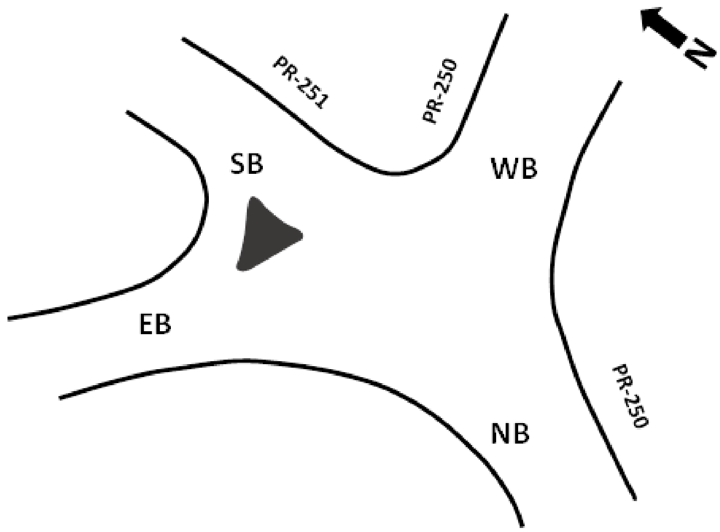
Table 25 Summary of Results – Intersection 2 (2015)



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	---	---	0.02	---
95% Queue Length	---	---	0.05	---
Movement Control Delay (sec/veh)	---	---	7.4	---
LOS	---	---	A	---
Approach Control Delay/LOS	---	---	--	---
Intersection Delay (sec/veh)/LOS	7.4/A			

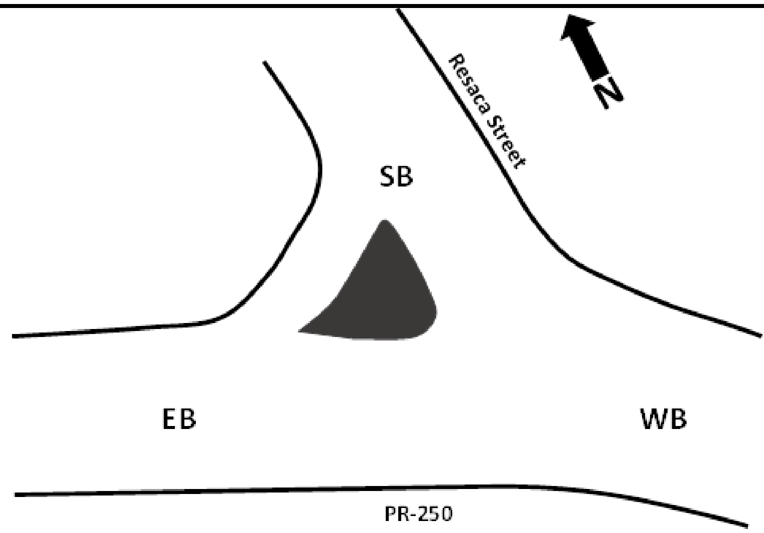
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	---	---	0.02	---
95% Queue Length	---	---	0.06	---
Movement Control Delay (sec/veh)	---	---	7.4	---
LOS	---	---	A	---
Approach Control Delay/LOS	---	---	---	---
Intersection Delay (sec/veh)/LOS	7.4/A			

Table 26 Summary of Results – Intersection 3 (2015)



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.14	0.27	0.02	0.02
95% Queue Length	0.47	1.08	0.07	0.07
Movement Control Delay (sec/veh)	10.3	12.5	7.4	7.6
LOS	B	B	A	A
Approach Control Delay/LOS	10.3/B	12.5/B	---	---
Intersection Delay (sec/veh)/LOS	10.9/B			
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.13	0.32	0.04	0.04
95% Queue Length	0.45	1.38	0.13	0.12
Movement Control Delay (sec/veh)	12.6	14.5	7.5	7.7
LOS	B	B	A	A
Approach Control Delay/LOS	12.6/B	14.4/B	---	---
Intersection Delay (sec/veh)/LOS	12.0/B			

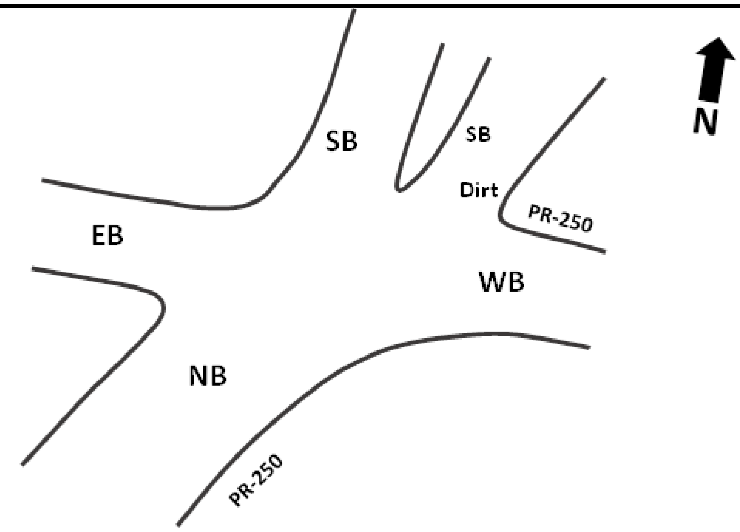
Table 27 Summary of Results – Intersection 4 (2015)



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.03	---	---	0.06
95% Queue Length	0.09	---	---	0.19
Movement Control Delay (sec/veh)	7.6	---	---	9.4
LOS	A	---	---	A
Approach Control Delay/LOS	---	---	---	9.4/A
Intersection Delay (sec/veh)/LOS	8.6/A			

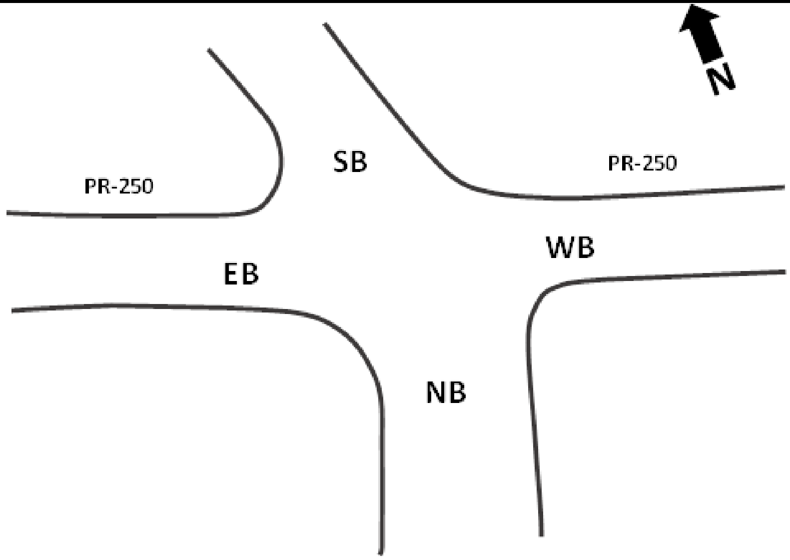
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.05		---	0.11
95% Queue Length	0.16		---	0.35
Movement Control Delay (sec/veh)	7.7		---	10.6
LOS	A		---	B
Approach Control Delay/LOS	10.9/B	10.2/B	---	10.6/B
Intersection Delay (sec/veh)/LOS	9.2/A			

Table 28 Summary of Results – Intersection 5 (2015)



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.00	0.04	0.06	0.03
95% Queue Length	0.00	0.12	0.19	0.09
Movement Control Delay (sec/veh)	7.3	7.3	9.2	10.3
LOS	A	A	A	B
Approach Control Delay/LOS	---	---	9.2/A	10.3/B
Intersection Delay (sec/veh)/LOS	8.5/A			
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.00	0.05	0.08	0.03
95% Queue Length	0.01	0.15	0.26	0.08
Movement Control Delay (sec/veh)	7.5	7.3	9.8	11.5
LOS	A	A	A	B
Approach Control Delay/LOS	---	---	9.8/A	11.5/B
Intersection Delay (sec/veh)/LOS	8.7/A			

Table 29 Summary of Results – Intersection 6 (2015)



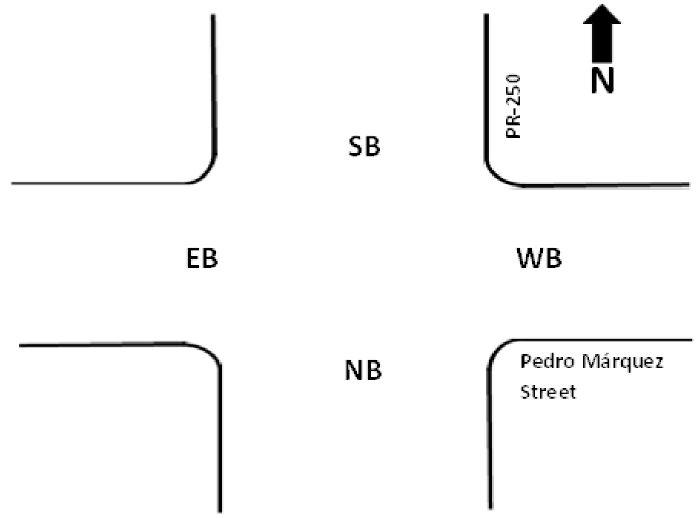
AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.00	0.03	0.16	0.02
95% Queue Length	0.01	0.08	0.56	0.05
Movement Control Delay (sec/veh)	7.3	7.7	10.8	9.8
LOS	A	A	B	A
Approach Control Delay/LOS	---	---	10.8/B	9.8/A
Intersection Delay (sec/veh)/LOS	10.0/A			
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.00	0.05	0.21	0.01
95% Queue Length	0.01	0.17	0.77	0.02
Movement Control Delay (sec/veh)	7.2	7.9	12.2	12.3
LOS	A	A	B	B
Approach Control Delay/LOS	---	---	12.2/B	12.3/B
Intersection Delay (sec/veh)/LOS	10.7/B			

The influence area will continue to operate well (LOS B or better) during the opening year of the temporary cargo ramp terminal in San Idelfonso. Intersection 6 will be the most impacted with a LOS B from a current LOS A in the afternoon peak hour, but these operation conditions are still good. The increase in delay at intersection 6 remains below the increment threshold value of 15 sec/veh allowed by the PRHTA, as per Table VII of the “Guías para la Preparación de Estudios Operacionales de Accesos y de Tránsito para Puerto Rico.” In fact, the increment in delay that vehicles will likely experience at intersection 6 will be 1.4 sec/veh during the AM peak hour and 2.1 sec/veh during the PM peak hour.

Cyclists’ operations will not be affected by the temporary relocation of the cargo ramp terminal. This mode of transportation is independent of the redistribution of traffic.

In order to evaluate the impact during long weekends for the project’s opening year (2015), when Culebra gets crowded with visitors, a factor of 2.0 was applied to the volumes collected (vehicles and heavy vehicles) during weekdays, in order to simulate the worst traffic conditions that can be expected. Tables 30 through 35 show the results of this analysis.

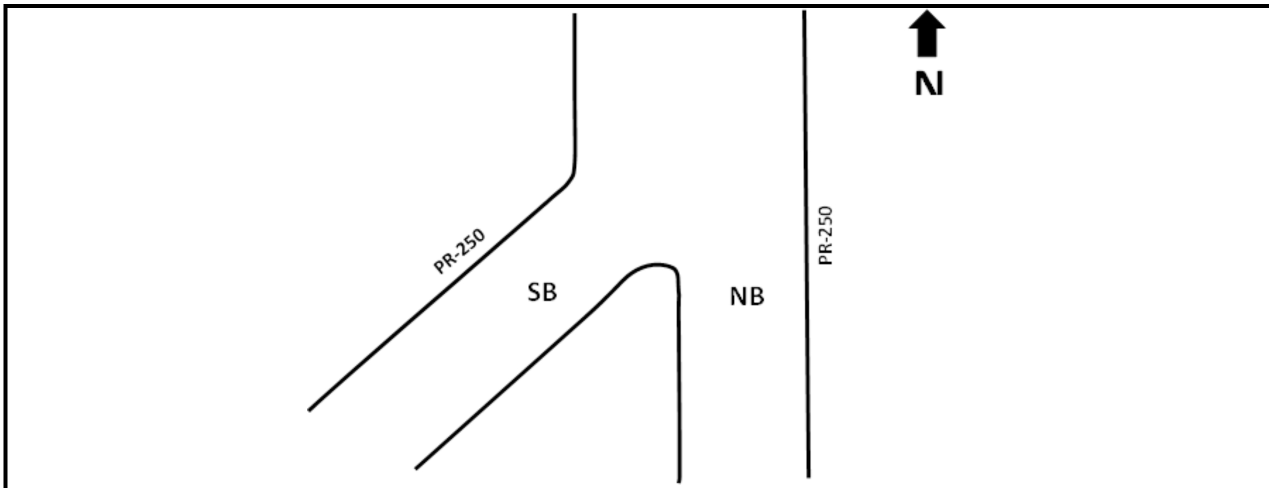
Table 30 Summary of Results – Intersection 1 (2015) – LONG WEEKENDS



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.27	0.02	0.02	---
95% Queue Length	1.09	0.05	0.05	---
Movement Control Delay (sec/veh)	11.5	10.0	7.2	---
LOS	B	A	A	---
Approach Control Delay/LOS	11.5/B	10.0/A	---	---
Intersection Delay (sec/veh)/LOS	10.9/B			

PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.28	0.02	0.01	---
95% Queue Length	1.15	0.06	0.02	---
Movement Control Delay (sec/veh)	11.9	9.5	7.2	---
LOS	B	A	A	---
Approach Control Delay/LOS	11.9/B	9.5/A	---	---
Intersection Delay (sec/veh)/LOS	11.7/B			

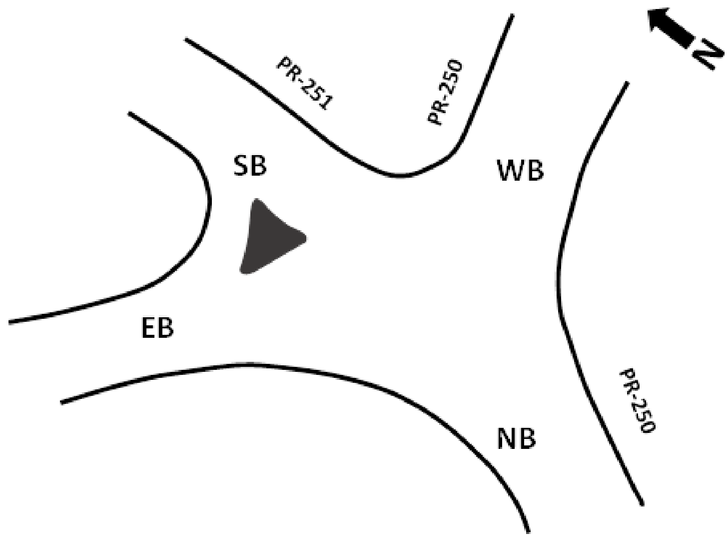
Table 31 Summary of Results – Intersection 2 (2015) – LONG WEEKENDS



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	---	---	0.03	---
95% Queue Length	---	---	0.11	---
Movement Control Delay (sec/veh)	---	---	7.7	---
LOS	---	---	A	---
Approach Control Delay/LOS	---	---	--	---
Intersection Delay (sec/veh)/LOS	7.7/A			

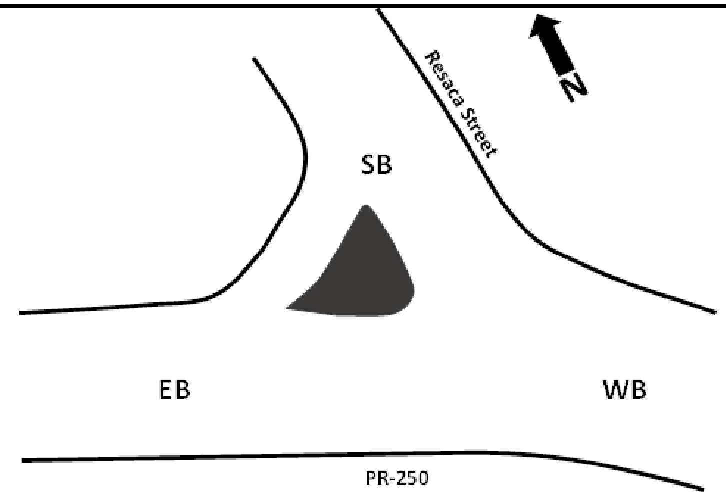
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	---	---	0.04	---
95% Queue Length	---	---	0.13	---
Movement Control Delay (sec/veh)	---	---	7.7	---
LOS	---	---	A	---
Approach Control Delay/LOS	---	---	---	---
Intersection Delay (sec/veh)/LOS	7.7/A			

Table 32 Summary of Results – Intersection 3 (2015) – LONG WEEKENDS



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.43	1.01	0.05	0.06
95% Queue Length	2.12	11.76	0.15	0.19
Movement Control Delay (sec/veh)	17.2	85.0	7.6	8.1
LOS	C	F	A	A
Approach Control Delay/LOS	17.2/C	85.0/F		
Intersection Delay (sec/veh)/LOS	49.0/E			
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.64	1.55	0.09	0.09
95% Queue Length	3.84	22.00	0.29	0.31
Movement Control Delay (sec/veh)	45.7	304.9	7.9	8.5
LOS	E	F	A	A
Approach Control Delay/LOS	45.7/E	304.9/F	---	---
Intersection Delay (sec/veh)/LOS	161.0/F			

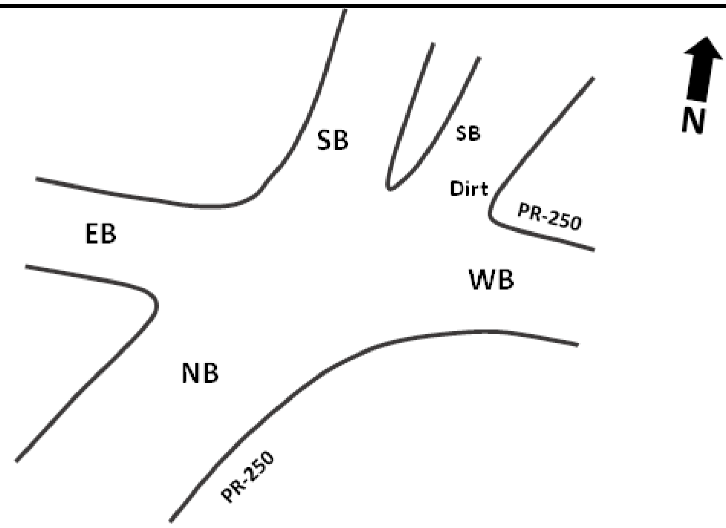
Table 33 Summary of Results – Intersection 4 (2015) – LONG WEEKENDS



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.07	---	---	0.15
95% Queue Length	0.22	---	---	0.54
Movement Control Delay (sec/veh)	8.2	---	---	11.3
LOS	A	---	---	B
Approach Control Delay/LOS	---	---	---	11.3/B
Intersection Delay (sec/veh)/LOS	9.9/A			

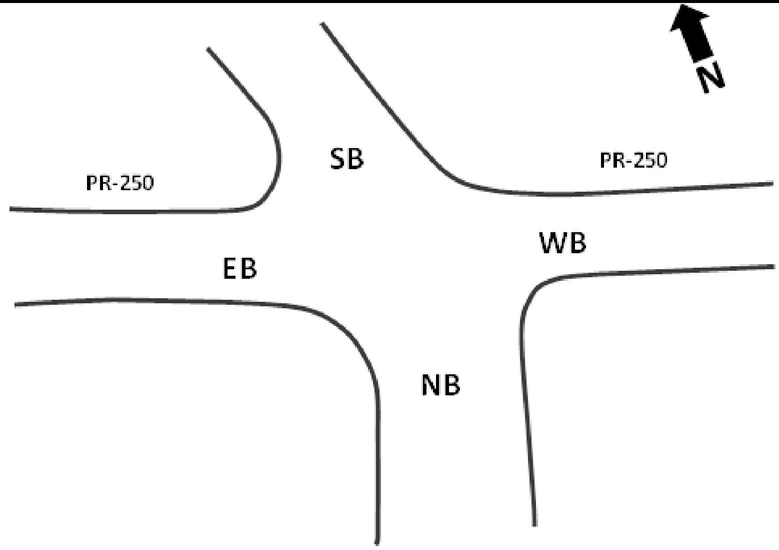
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.12	---	---	0.33
95% Queue Length	0.41	---	---	1.41
Movement Control Delay (sec/veh)	8.5	---	---	16.5
LOS	A	---	---	C
Approach Control Delay/LOS	---	---	---	16.5/C
Intersection Delay (sec/veh)/LOS	12.6/B			

Table 34 Summary of Results – Intersection 5 (2015) – LONG WEEKENDS



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.00	0.08	0.14	0.08
95% Queue Length	0.00	0.26	0.50	0.27
Movement Control Delay (sec/veh)	7.4	7.5	10.4	13.1
LOS	A	A	B	B
Approach Control Delay/LOS	---	---	10.4/B	13.1/B
Intersection Delay (sec/veh)/LOS	9.5/A			
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.01	0.10	0.19	0.09
95% Queue Length	0.02	0.33	0.68	0.29
Movement Control Delay (sec/veh)	7.8	7.5	14.0	16.5
LOS	A	A	B	C
Approach Control Delay/LOS	---	---	14.0/B	16.5/C
Intersection Delay (sec/veh)/LOS	10.5/B			

Table 35 Summary of Results – Intersection 6 (2015) – LONG WEEKENDS



AM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.01	0.08	0.46	0.04
95% Queue Length	0.02	0.25	2.38	0.14
Movement Control Delay (sec/veh)	7.4	9.2	18.0	11.8
LOS	A	A	C	B
Approach Control Delay/LOS	---	---	18.0/C	11.8/B
Intersection Delay (sec/veh)/LOS	15.4/C			
PM				
Direction	**EB**	**WB**	**NB**	**SB**
Movement	LTR	LTR	LTR	LTR
v/c ratio	0.01	0.13	0.71	0.03
95% Queue Length	0.02	0.45	5.24	0.09
Movement Control Delay (sec/veh)	7.3	8.9	35.4	19.2
LOS	A	A	E	C
Approach Control Delay/LOS	---	---	35.4/E	19.2/C
Intersection Delay (sec/veh)/LOS	25.6/D			

During long weekends, some of the intersections along the influence area will be negatively impacted, a situation that is likely to occur nowadays during long weekends with the cargo ramp terminal located at Dewey. Generally, however, the influence area will continue to operate acceptably with LOS D or better during both peak hours of the day. Only intersection 3 is likely to operate at LOS E and F during the AM and PM peak hours, respectively. This intersection has an odd geometry. Even though it is a four-leg intersection, its approaches are not aligned with one another, making it difficult for drivers to see traffic approaching the intersection from all directions. The geometry of this intersection is likely to create longer delays, as drivers do not have full sight distances to make quick decisions while at the approaches.

Intersection 6 will receive more crossroad traffic from the new cargo ramp terminal, which will be located south of the intersection. Therefore, its operation is likely to be impacted during long weekends. This is one of the intersections that do not have STOP regulatory signs in place at the corner of the crossroads. One of the recommendations of this study is to include these regulatory signs in order to properly control the intersection once the cargo ramp terminal is temporarily relocated to San Idelfonso.

RESULTS

A traffic impact study was conducted for the proposed temporary relocation of the cargo ramp terminal at Dewey in the Municipality of Culebra. The relocation consists on moving the existing cargo ramp terminal from Dewey to San Idelfonso.

The study's main objective was to determine the impact that said relocation will have on the traffic capacity of the influence area. The study was prepared following the requirements established by the PRHTA in its "*Guías para la Preparación de Estudios Operacionales de Accesos y Tránsito para Puerto Rico*" (PRHTA, 2004).

From the traffic count data collected on Tuesday, August 26, 2014, it was determined that, in the study area, the morning peak hour is from 10:00 to 11:00 AM and the afternoon peak hour is from 3:45 to 4:45 PM. According to the PRHTA's requirements, and considering that it is a temporary relocation, two scenarios were analyzed: existing conditions (2014) and project's opening year (2015). The models were developed using the HCS2010.

After conducting the traffic capacity analyses for the proposed project, the following findings were made:

<u>Existing Condition</u>

- ⇒ The influence area currently operates at free-flow speed or LOS A, except for intersection 3, which operates generally at free-flow speed, but with some traffic stream restrictions or LOS B.

- ⇒ Intersections 3, 5 and 6 are all missing STOP regulatory signs at one or more of its crossroads.

- ⇒ The average peak hour volume along the influence area is approximately 72 vph.

- ⇒ Cyclists represent a legitimate mode of transportation along the influence area studied.

<u>Opening Year Condition</u>

- ⇒ The influence area will continue to operate well (LOS B or better) during the opening year. Intersection 6 will be the most impacted with a downgrade to LOS B from a current LOS A in the afternoon peak hour, but these operation conditions are still very good.

- ⇒ The operation of cyclists will not be affected by the temporary relocation of the cargo ramp terminal to San Idelfonso. This mode of transportation is independent of the redistribution of traffic resulting from the temporary cargo ramp terminal relocation.

- ⇒ In order to evaluate the impact on long weekends during the project's opening year (2015), a factor of 2.0 was applied to the volumes (vehicles and heavy vehicles) collected during weekdays to simulate the worst traffic conditions that Culebra may experience.

⇒ During long weekends, some of the intersections along the influence area will be negatively impacted, a situation that is likely to occur nowadays with the cargo ramp terminal located at Dewey.

⇒ However, the influence area will continue to operate acceptably with LOS D or better during both peak hours of the day.

⇒ Intersection 3 is likely to operate at LOS E and F during the AM and PM peak hours, respectively. This intersection has an odd geometry. Even though it is a four-leg intersection, its approaches are not aligned with one another, making it more difficult for drivers to see traffic approaching the intersection from all directions. The geometry of this intersection is likely to create longer delays, as drivers do not have full sight distances to make fast decisions while at the approaches.

⇒ Intersection 6 will receive more crossroad traffic from the new cargo ramp terminal, which will be located south of the intersection. Therefore, its operation is likely to be impacted during long weekends. This is one of the intersections that do not have STOP regulatory signs in place at the corner of the crossroads.

CONCLUSIONS AND RECOMMENDATIONS

After evaluating the existing roadways within the influence area, the proposed project is recommended. The traffic capacity analysis revealed that the influence area will continue to operate well once the cargo ramp terminal is relocated from Dewey to San Idelfonso. The study revealed that, during long weekends, when Culebra receives a large number of visitors, intersection 3 will be the most affected. However, this situation does not occur frequently and has no impact during weekdays' peak hours. Additionally, this situation is likely to occur nowadays with the cargo ramp terminal at Dewey.

The following recommendations shall be considered:

- Provide STOP regulatory signs on the crossroads (minor roads) at intersections 3, 5 and 6.
- Provide directional and/or service signs to identify the location of the temporary cargo ramp terminal.
- Provide pedestrian accesses and pick-up/drop-off areas within the relocated cargo ramp terminal.
- Complete the pavement markings along the local road toward the relocated cargo ramp terminal.

CERTIFICATION OF WORK

I certify that the information presented herein is true, accurate, and complete and that it was obtained and analyzed using the criteria of the best practice used and accepted by traffic engineering in the Puerto Rico Highway and Transportation Authority.

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Vanessa Amado, PhD, PE

License Number 20887

Appendix A – Raw Traffic Count Data (every 15 minutes) for a 12-Hour Period Tabulated in a Spreadsheet

File Name: Intersection #1 vehiculos
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Pedro Marquez Street

	SB			WB			NB			EB				
Start Time	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**15-Min Totals**	**1 Hour Totals**
06:00 AM	0	0	0	0	0	0	0	5	4	0	0	23	32	85
06:15 AM	0	0	0	0	0	0	0	1	2	1	0	22	26	82
06:30 AM	0	0	0	0	0	0	0	3	1	0	1	5	10	85
06:45 AM	0	0	0	0	0	0	0	4	2	1	0	10	17	110
07:00 AM	0	0	0	0	0	0	0	10	4	1	1	13	29	126
07:15 AM	0	0	0	0	0	0	0	11	0	6	0	12	29	120
07:30 AM	0	0	0	2	0	0	0	7	7	3	0	16	35	128
07:45 AM	0	0	0	0	0	0	0	10	3	2	0	18	33	133
08:00 AM	0	0	0	0	0	0	1	6	4	1	1	10	23	141
08:15 AM	0	0	0	0	0	0	0	9	1	4	0	23	37	146
08:30 AM	0	0	0	0	1	0	0	12	5	0	0	22	40	147
08:45 AM	0	0	0	0	0	0	0	14	3	2	2	20	41	148
09:00 AM	0	0	0	0	0	0	0	12	4	0	0	12	28	139
09:15 AM	0	0	0	0	0	1	0	15	6	0	0	16	38	143
09:30 AM	0	0	0	0	0	0	1	12	8	1	0	19	41	138
09:45 AM	0	0	0	0	1	0	0	10	4	0	1	16	32	156
10:00 AM	0	0	0	0	0	0	2	11	5	2	1	11	32	178
10:15 AM	0	0	0	0	0	0	0	8	7	0	1	17	33	157
10:30 AM	0	0	0	0	1	0	0	13	1	4	1	39	59	142
10:45 AM	0	0	0	1	0	0	1	18	1	2	2	29	54	101
11:00 AM	0	0	0	0	0	0	0	2	1	1	1	6	11	65
11:15 AM	0	0	0	0	0	0	0	4	2	1	1	10	18	68
11:30 AM	0	0	0	0	0	0	0	5	1	1	2	9	18	73
11:45 AM	0	0	0	0	0	0	0	3	3	2	2	8	18	78
12:00 PM	0	0	0	0	0	0	0	2	2	2	1	7	14	86
12:15 PM	0	0	0	0	0	0	0	12	1	3	1	6	23	106
12:30 PM	0	0	0	0	0	0	0	10	3	1	0	9	23	134
12:45 PM	0	0	0	0	0	0	0	9	2	2	2	11	26	143
01:00 PM	0	0	0	1	0	0	0	9	5	4	1	14	34	162
01:15 PM	0	0	0	0	0	1	0	16	4	2	1	27	51	178
01:30 PM	0	0	0	0	0	0	0	9	3	3	0	17	32	164
01:45 PM	0	0	0	0	1	1	0	20	6	7	1	9	45	174
02:00 PM	0	0	0	0	1	0	1	15	4	2	3	24	50	169
02:15 PM	0	0	0	0	0	1	0	11	3	4	2	16	37	167
02:30 PM	0	0	0	0	0	1	0	17	5	3	0	16	42	190
02:45 PM	0	0	0	0	0	0	0	15	5	0	2	18	40	198
03:00 PM	0	0	0	1	0	0	1	12	1	4	1	28	48	189
03:15 PM	0	0	0	0	0	0	1	21	8	4	2	24	60	207
03:30 PM	0	0	0	0	0	0	0	14	2	4	2	28	50	213
03:45 PM	0	0	0	0	0	0	1	11	3	2	0	14	31	231
04:00 PM	0	0	0	1	0	0	1	19	1	2	0	42	66	243
04:15 PM	0	0	0	2	0	0	0	24	2	3	1	34	66	227
04:30 PM	0	0	0	0	0	0	0	27	3	3	0	35	68	195
04:45 PM	0	0	0	0	2	1	0	12	4	4	1	19	43	164
05:00 PM	0	0	0	1	0	0	0	24	3	1	0	21	50	146
05:15 PM	0	0	0	2	0	0	1	20	1	3	0	7	34	
05:30 PM	0	0	0	1	0	0	1	15	7	3	2	8	37	
05:45 PM	0	0	0	0	0	0	0	16	2	3	0	4	25	

File Name: Camiones #1
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Pedro Marquez Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
06:15 AM	0	0	0	0	0	0	0	0	1	1	0	0	2	3
06:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	4
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
07:15 AM	0	0	0	0	0	0	0	0	0	1	1	1	3	5
07:30 AM	0	0	0	1	0	0	0	0	0	0	0	0	1	2
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
08:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	1	5
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
08:30 AM	0	0	0	0	0	0	0	2	0	0	0	0	2	5
08:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	2	3
09:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	1
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	1	1
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	3
12:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	1	2
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	1	1
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
01:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	1	1
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	1	2
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
03:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	1	2
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	

File Name: Ciclistas #1
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Pedro Marquez Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
06:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	3
07:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	2
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	1
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
08:15 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	4
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
08:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	1	6
09:00 AM	0	0	0	0	0	0	0	1	0	1	0	0	2	6
09:15 AM	0	0	0	0	0	0	0	2	0	0	0	0	2	4
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	2
09:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	1
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
10:45 AM	0	0	0	2	0	0	0	0	0	0	2	0	4	4
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
11:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	3
12:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	2	2
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
01:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	2	5
01:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	1	4
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	2	2	3
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	1	5
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	2	2	5
02:45 PM	0	0	0	0	0	0	0	1	0	0	0	1	2	3
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
03:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	1
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	1	3
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:45 PM	0	0	0	0	0	0	0	0	0	2	0	0	2	

File Name: Intersection #2 vehiculos
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Salisberry Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	33	0	0	0	0	0	0	25	0	0	0	0	58	151
06:15 AM	21	0	0	0	0	0	0	19	2	0	0	0	42	140
06:30 AM	15	0	0	0	0	0	0	9	0	0	0	0	24	161
06:45 AM	13	0	0	0	0	0	0	14	0	0	0	0	27	193
07:00 AM	24	0	0	0	0	0	0	23	0	0	0	0	47	224
07:15 AM	40	0	0	0	0	0	0	23	0	0	0	0	63	238
07:30 AM	31	0	0	0	0	0	0	22	3	0	0	0	56	235
07:45 AM	31	0	0	0	0	0	0	26	1	0	0	0	58	248
08:00 AM	42	0	0	0	0	0	0	17	2	0	0	0	61	249
08:15 AM	29	0	0	0	0	0	0	22	9	0	0	0	60	243
08:30 AM	31	0	0	0	0	0	0	33	5	0	0	0	69	240
08:45 AM	30	0	0	0	0	0	0	27	2	0	0	0	59	243
09:00 AM	27	0	0	0	0	0	0	26	2	0	0	0	55	242
09:15 AM	26	0	0	0	0	0	0	27	4	0	0	0	57	232
09:30 AM	43	0	0	0	0	0	0	25	4	0	0	0	72	230
09:45 AM	26	0	0	0	0	0	0	29	3	0	0	0	58	247
10:00 AM	22	0	0	0	0	0	0	19	4	0	0	0	45	291
10:15 AM	31	0	0	0	0	0	0	21	3	0	0	0	55	324
10:30 AM	30	6	0	0	0	0	0	47	6	0	0	0	89	353
10:45 AM	50	0	0	0	0	0	0	46	6	0	0	0	102	344
11:00 AM	44	0	0	0	0	0	0	30	4	0	0	0	78	320
11:15 AM	45	0	0	0	0	0	0	36	3	0	0	0	84	318
11:30 AM	39	0	0	0	0	0	0	39	2	0	0	0	80	314
11:45 AM	32	0	0	0	0	0	0	41	5	0	0	0	78	280
12:00 PM	38	0	0	0	0	0	0	35	3	0	0	0	76	249
12:15 PM	41	0	0	0	0	0	0	38	1	0	0	0	80	258
12:30 PM	22	0	0	0	0	0	0	22	2	0	0	0	46	241
12:45 PM	23	0	0	0	0	0	0	20	4	0	0	0	47	250
01:00 PM	40	0	0	0	0	0	0	39	6	0	0	0	85	263
01:15 PM	28	0	0	0	0	0	0	32	3	0	0	0	63	241
01:30 PM	26	1	0	0	0	0	0	25	3	0	0	0	55	228
01:45 PM	31	1	0	0	0	0	0	27	1	0	0	0	60	242
02:00 PM	25	0	0	0	0	0	0	37	1	0	0	0	63	263
02:15 PM	23	1	0	0	0	0	0	26	0	0	0	0	50	283
02:30 PM	35	0	0	0	0	0	0	33	0	0	0	1	69	331
02:45 PM	39	0	0	0	0	0	0	38	4	0	0	0	81	328
03:00 PM	43	0	0	0	0	0	0	38	2	0	0	0	83	337
03:15 PM	41	0	0	0	0	0	0	56	1	0	0	0	98	344
03:30 PM	35	0	0	0	0	0	0	27	4	0	0	0	66	353
03:45 PM	45	0	0	0	0	0	0	43	2	0	0	0	90	397
04:00 PM	37	0	0	0	0	0	0	46	7	0	0	0	90	376
04:15 PM	42	0	0	0	0	0	0	61	4	0	0	0	107	341
04:30 PM	50	0	0	0	0	0	0	60	0	0	0	0	110	299
04:45 PM	33	0	0	0	0	0	0	36	0	0	0	0	69	228
05:00 PM	24	0	0	0	0	0	0	28	3	0	0	0	55	201
05:15 PM	32	0	0	0	0	0	0	32	1	0	0	0	65	
05:30 PM	16	0	0	0	0	0	0	20	3	0	0	0	39	
05:45 PM	24	0	0	0	0	0	0	17	1	0	0	0	42	

File Name: Camiones #2
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Salisberry Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
06:15 AM	2	0	0	0	0	0	0	0	0	0	0	0	2	6
06:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	5
06:45 AM	1	0	0	0	0	0	0	0	0	0	0	0	1	6
07:00 AM	2	0	0	0	0	0	0	0	0	0	0	0	2	6
07:15 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	7
07:30 AM	1	0	0	0	0	0	0	1	0	0	0	0	2	6
07:45 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	6
08:00 AM	2	0	0	0	0	0	0	1	0	0	0	0	3	7
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	6
08:30 AM	0	0	0	0	0	0	0	2	0	0	0	0	2	6
08:45 AM	1	0	0	0	0	0	0	1	0	0	0	0	2	4
09:00 AM	1	0	0	0	0	0	0	1	0	0	0	0	2	2
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
10:30 AM	1	0	0	0	0	0	0	0	0	0	0	0	1	2
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	3
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
11:30 AM	1	0	0	0	0	0	0	0	0	0	0	0	1	3
11:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	2
12:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
01:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	3
01:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	2
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
02:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	2
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
02:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	4
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
03:15 PM	2	0	0	0	0	0	0	0	0	0	0	0	2	12
03:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	10
03:45 PM	2	0	0	0	0	0	0	0	0	0	0	0	2	10
04:00 PM	4	0	0	0	0	0	0	2	1	0	0	0	7	10
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
04:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	4
04:45 PM	1	0	0	0	0	0	0	1	0	0	0	0	2	4
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
05:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	
05:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	

File Name: Ciclistas #2
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Salisberry Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	1	0	0	0	0	0	0	0	0	0	0	0	1	5
06:15 AM	1	0	0	0	0	0	0	0	0	0	0	0	1	5
06:30 AM	2	0	0	0	0	0	0	0	0	0	0	0	2	6
06:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	5
07:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	5
07:15 AM	1	0	0	0	0	0	0	1	0	0	0	0	2	5
07:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	4
07:45 AM	1	0	0	0	0	0	0	0	0	0	0	0	1	3
08:00 AM	1	0	0	0	0	0	0	0	0	0	0	0	1	2
08:15 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	3
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	6
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	7
09:00 AM	1	0	0	0	0	0	0	1	0	0	0	0	2	8
09:15 AM	1	0	0	0	0	0	0	3	0	0	0	0	4	6
09:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	3
09:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	2
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
10:15 AM	1	0	0	0	0	0	0	0	0	0	0	0	1	5
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
10:45 AM	0	0	0	0	0	0	0	4	0	0	0	0	4	5
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	4
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	6
12:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	6
12:15 PM	0	0	0	0	0	0	0	2	0	0	0	0	2	5
12:30 PM	1	0	0	0	0	0	0	2	0	0	0	0	3	7
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	7
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	7
01:15 PM	1	0	0	0	0	0	0	3	0	0	0	0	4	8
01:30 PM	2	0	0	0	0	0	0	1	0	0	0	0	3	6
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
02:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	7
02:15 PM	1	0	0	0	0	0	0	1	0	0	0	0	2	9
02:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	9
02:45 PM	1	0	0	0	0	0	0	2	0	0	0	0	3	8
03:00 PM	1	1	0	0	0	0	0	1	0	0	0	0	3	5
03:15 PM	2	0	0	0	0	0	0	0	0	0	0	0	2	2
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	6
04:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	7
05:00 PM	1	1	0	0	0	0	0	1	0	0	0	0	3	9
05:15 PM	1	0	0	0	0	0	0	1	0	0	0	0	2	
05:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	
05:45 PM	2	0	0	0	0	0	0	1	0	0	0	0	3	

File Name: Intersection #3 vehiculos
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with PR-251 and Monserrate Colon Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	2	11	4	7	1	12	8	11	3	3	3	1	66	228
06:15 AM	3	4	8	6	2	12	14	6	1	3	1	2	62	225
06:30 AM	0	7	6	5	3	8	5	5	1	0	1	4	45	228
06:45 AM	0	6	6	6	5	14	4	8	0	0	2	4	55	273
07:00 AM	2	11	7	7	1	11	8	6	3	3	1	3	63	323
07:15 AM	4	8	8	6	2	18	5	8	0	3	2	1	65	349
07:30 AM	4	11	7	5	2	23	17	10	4	2	2	3	90	354
07:45 AM	2	14	5	13	3	25	20	11	5	2	3	2	105	354
08:00 AM	4	16	7	10	2	24	10	9	2	3	2	0	89	331
08:15 AM	2	4	10	5	4	18	13	7	0	2	1	4	70	316
08:30 AM	1	9	9	10	2	17	16	18	1	4	3	0	90	324
08:45 AM	1	13	13	8	3	13	16	9	0	1	1	4	82	309
09:00 AM	2	6	8	10	3	14	15	10	0	1	4	1	74	310
09:15 AM	2	10	11	6	1	18	11	11	1	1	3	3	78	307
09:30 AM	2	5	8	10	1	15	11	15	2	3	0	3	75	311
09:45 AM	5	7	8	11	2	20	14	7	3	1	2	3	83	332
10:00 AM	3	9	8	9	1	8	14	6	2	5	3	3	71	388
10:15 AM	5	12	8	11	1	19	8	12	1	2	1	2	82	408
10:30 AM	2	10	8	6	2	13	17	19	6	8	1	4	96	418
10:45 AM	4	16	8	17	3	19	16	22	9	20	2	3	139	402
11:00 AM	3	11	5	10	2	12	12	20	5	8	1	2	91	351
11:15 AM	4	10	6	9	1	10	14	21	4	10	1	2	92	347
11:30 AM	2	9	7	6	2	9	10	15	6	9	2	3	80	336
11:45 AM	2	12	9	5	3	14	9	16	5	6	3	4	88	330
12:00 PM	3	14	10	3	4	15	16	11	3	5	1	2	87	316
12:15 PM	1	10	5	4	3	16	13	18	2	4	2	3	81	358
12:30 PM	2	6	3	9	5	19	11	10	2	3	2	2	74	360
12:45 PM	3	8	4	11	2	20	8	9	3	4	1	1	74	359
01:00 PM	6	20	10	19	1	24	19	21	1	4	2	2	129	365
01:15 PM	4	12	7	6	4	12	13	15	3	2	3	2	83	336
01:30 PM	4	13	8	4	2	13	12	9	2	3	2	1	73	336
01:45 PM	2	11	3	11	1	18	12	14	0	3	2	3	80	359
02:00 PM	3	13	16	14	4	6	15	16	3	3	3	4	100	388
02:15 PM	2	7	8	12	3	17	12	11	4	1	3	3	83	433
02:30 PM	3	13	9	15	3	15	14	13	1	4	3	3	96	471
02:45 PM	4	15	9	11	7	23	22	6	2	4	3	3	109	491
03:00 PM	7	20	10	13	7	19	27	17	9	5	6	5	145	500
03:15 PM	2	14	13	14	2	15	25	17	7	6	4	2	121	472
03:30 PM	0	13	10	13	7	25	24	12	3	2	3	4	116	495
03:45 PM	8	15	14	13	0	17	17	15	8	6	4	1	118	519
04:00 PM	1	16	10	8	4	12	17	26	8	5	6	4	117	507
04:15 PM	7	15	17	15	6	18	25	17	11	7	2	4	144	498
04:30 PM	10	21	13	10	5	18	22	12	15	8	3	3	140	440
04:45 PM	2	12	20	11	3	10	13	17	6	3	5	4	106	374
05:00 PM	2	14	13	14	8	12	14	13	5	1	11	1	108	332
05:15 PM	6	11	14	10	1	14	15	5	1	1	4	4	86	
05:30 PM	2	10	8	11	2	8	14	9	0	2	4	4	74	
05:45 PM	1	12	11	10	2	12	10	2	1	1	2	0	64	

File Name: Camiones #3
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with PR-251 and Monserrate Colon Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	6
06:15 AM	0	1	0	2	0	0	0	0	0	0	0	0	3	6
06:30 AM	0	1	0	0	0	0	1	0	0	0	0	0	2	4
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
07:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	5
07:15 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	5
07:30 AM	0	0	0	0	0	1	0	0	0	0	0	0	1	4
07:45 AM	0	0	1	0	0	0	1	0	0	0	0	0	2	3
08:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	1	1
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	7
09:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	8
09:15 AM	1	0	1	1	0	0	0	0	0	0	0	1	4	7
09:30 AM	0	1	0	0	0	0	0	0	0	0	1	0	2	4
09:45 AM	0	0	1	0	0	0	0	0	0	0	0	0	1	4
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
10:15 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	4
10:30 AM	0	1	0	0	0	0	0	0	0	0	1	0	2	4
10:45 AM	0	0	1	0	0	0	0	0	0	0	0	0	1	3
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
11:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	3
11:30 AM	0	1	0	0	0	0	0	0	0	0	0	0	1	4
11:45 AM	0	0	1	0	0	0	0	0	0	0	0	0	1	3
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
12:15 PM	0	1	0	0	1	0	0	0	0	0	0	0	2	3
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	7
01:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	7
01:15 PM	0	1	0	1	0	1	0	0	0	0	0	0	3	8
01:30 PM	0	1	0	1	0	0	0	1	0	0	0	0	3	5
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
02:00 PM	0	0	1	0	0	0	1	0	0	0	0	0	2	6
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	6
02:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	1	7
02:45 PM	0	0	1	0	0	0	1	1	0	0	0	0	3	7
03:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	2	4
03:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	4
03:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	4
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
04:00 PM	0	1	0	0	0	0	1	0	0	0	0	0	2	3
04:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	1	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	

File Name: Ciclistas #3
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with PR-251 and Monserrate Colon Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	1	4
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
06:30 AM	0	0	0	0	0	2	0	0	0	0	0	0	2	4
06:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	5
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	7
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	8
07:30 AM	0	0	0	0	0	0	0	0	0	0	2	1	3	8
07:45 AM	0	0	1	0	1	1	0	0	0	0	0	0	3	7
08:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	1	5
08:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	5
08:30 AM	0	0	0	0	1	0	0	0	0	0	1	0	2	5
08:45 AM	0	0	0	1	0	0	0	0	0	0	0	0	1	3
09:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	2
09:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	1	2
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	5
10:15 AM	0	2	0	0	0	0	0	0	0	0	0	0	2	4
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
10:45 AM	0	0	0	0	0	0	0	2	0	0	0	0	2	4
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:30 AM	0	1	0	0	0	0	0	0	0	1	0	0	2	5
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
12:15 PM	0	0	0	0	0	0	0	2	0	0	1	0	3	4
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:45 PM	0	1	0	0	0	0	0	0	0	0	0	0	1	4
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
01:30 PM	0	0	0	0	0	0	0	2	0	0	1	0	3	6
01:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	6
02:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	1	7
02:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	1	8
02:30 PM	0	0	0	0	0	0	0	1	0	1	1	0	3	10
02:45 PM	0	0	0	0	1	0	1	0	0	0	0	0	2	7
03:00 PM	0	0	0	0	0	1	0	0	0	0	1	0	2	5
03:15 PM	0	2	0	0	0	0	0	1	0	0	0	0	3	3
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	10
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	12
04:45 PM	0	1	0	0	0	0	0	0	2	0	0	0	3	13
05:00 PM	0	0	0	1	0	0	1	0	0	3	2	0	7	15
05:15 PM	0	0	1	0	1	0	0	0	0	0	0	0	2	
05:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	1	
05:45 PM	0	2	0	0	3	0	0	0	0	0	0	0	5	

File Name: Intersection #4 vehiculos
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Resaca Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	6	0	0	2	15	0	0	0	0	0	12	3	38	148
06:15 AM	9	0	0	0	9	0	0	0	0	0	13	6	37	150
06:30 AM	10	0	2	2	10	0	0	0	0	0	8	4	36	159
06:45 AM	6	0	1	0	17	0	0	0	0	0	10	3	37	179
07:00 AM	10	0	2	3	6	0	0	0	0	0	11	8	40	220
07:15 AM	12	0	5	1	17	0	0	0	0	0	4	7	46	234
07:30 AM	9	0	1	2	19	0	0	0	0	0	18	7	56	246
07:45 AM	18	0	2	3	23	0	0	0	0	0	20	12	78	242
08:00 AM	15	0	3	1	17	0	0	0	0	0	16	2	54	219
08:15 AM	13	0	3	1	19	0	0	0	0	0	19	3	58	226
08:30 AM	7	0	1	0	15	0	0	0	0	0	21	8	52	215
08:45 AM	9	0	3	1	15	0	0	0	0	0	20	7	55	208
09:00 AM	9	0	1	3	18	0	0	0	0	0	20	10	61	200
09:15 AM	6	0	0	4	13	0	0	0	0	0	22	2	47	184
09:30 AM	8	0	1	0	17	0	0	0	0	0	13	6	45	177
09:45 AM	6	0	1	1	21	0	0	0	0	0	13	5	47	189
10:00 AM	4	0	1	1	13	0	0	0	0	0	22	4	45	208
10:15 AM	4	0	0	5	20	0	0	0	0	0	10	1	40	214
10:30 AM	8	0	0	3	17	0	0	0	0	0	19	10	57	216
10:45 AM	11	0	2	3	26	0	0	0	0	0	15	9	66	200
11:00 AM	9	0	1	2	20	0	0	0	0	0	11	8	51	169
11:15 AM	8	0	0	2	15	0	0	0	0	0	10	7	42	172
11:30 AM	7	0	1	3	12	0	0	0	0	0	9	9	41	179
11:45 AM	6	0	2	1	10	0	0	0	0	0	6	10	35	197
12:00 PM	5	0	0	4	19	0	0	0	0	0	20	6	54	222
12:15 PM	6	0	0	3	14	0	0	0	0	0	18	8	49	242
12:30 PM	9	0	2	4	20	0	0	0	0	0	17	7	59	242
12:45 PM	11	0	3	2	14	0	0	0	0	0	21	9	60	229
01:00 PM	15	0	2	3	23	0	0	0	0	0	23	8	74	219
01:15 PM	8	0	1	3	14	0	0	0	0	0	11	12	49	191
01:30 PM	13	0	1	3	8	0	0	0	0	0	13	8	46	198
01:45 PM	10	0	2	2	20	0	0	0	0	0	12	4	50	212
02:00 PM	7	0	2	2	11	0	0	0	0	0	19	5	46	241
02:15 PM	11	0	1	4	18	0	0	0	0	0	13	9	56	288
02:30 PM	11	0	3	4	15	0	0	0	0	0	14	13	60	301
02:45 PM	17	0	6	3	24	0	0	0	0	0	15	14	79	323
03:00 PM	14	0	4	3	30	0	0	0	0	0	26	16	93	304
03:15 PM	9	0	5	5	17	0	0	0	0	0	21	12	69	265
03:30 PM	13	0	2	1	28	0	0	0	0	0	27	11	82	283
03:45 PM	10	0	1	5	15	0	0	0	0	0	24	5	60	269
04:00 PM	8	0	6	2	12	0	0	0	0	0	15	11	54	275
04:15 PM	12	0	1	4	29	0	0	0	0	0	27	14	87	290
04:30 PM	11	0	0	1	17	0	0	0	0	0	21	18	68	262
04:45 PM	8	0	6	6	15	0	0	0	0	0	25	6	66	243
05:00 PM	20	0	1	1	11	0	0	0	0	0	18	18	69	223
05:15 PM	5	0	1	4	17	0	0	0	0	0	23	9	59	
05:30 PM	4	0	2	3	14	0	0	0	0	0	18	8	49	
05:45 PM	7	0	3	3	15	0	0	0	0	0	13	5	46	

File Name: Camiones #4
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Resaca Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	2	0	0	0	0	0	0	0	0	0	0	0	2	6
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
06:30 AM	0	0	1	0	0	0	0	0	0	0	1	0	2	5
06:45 AM	0	0	0	1	1	0	0	0	0	0	0	0	2	4
07:00 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	4
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	8
07:30 AM	0	0	0	1	0	0	0	0	0	0	0	0	1	8
07:45 AM	1	0	0	0	0	0	0	0	0	0	1	0	2	10
08:00 AM	0	0	1	0	3	0	0	0	0	0	0	1	5	9
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	6
08:30 AM	0	0	0	0	2	0	0	0	0	0	0	1	3	7
08:45 AM	0	0	1	0	0	0	0	0	0	0	0	0	1	5
09:00 AM	0	0	0	1	1	0	0	0	0	0	0	0	2	6
09:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	6
09:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	5
09:45 AM	0	0	0	0	0	0	0	0	0	0	2	0	2	5
10:00 AM	0	0	0	0	2	0	0	0	0	0	0	0	2	4
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
10:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	3
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	2
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	3
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
12:00 PM	0	0	0	0	1	0	0	0	0	0	1	0	2	4
12:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	2
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
12:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	4
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
01:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	5
01:30 PM	0	0	0	0	1	0	0	0	0	0	0	1	2	5
01:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	4
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	1	6
02:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	6
02:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	5
02:45 PM	0	0	0	0	0	0	0	0	0	0	2	1	3	4
03:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	3
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
03:45 PM	1	0	0	1	0	0	0	0	0	0	0	0	2	2
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	

File Name: Ciclistas #4
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Resaca Street

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	2	0	0	0	0	0	0	0	0	0	0	0	2	6
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
06:30 AM	0	0	1	0	0	0	0	0	0	0	1	0	2	5
06:45 AM	0	0	0	1	1	0	0	0	0	0	0	0	2	4
07:00 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	4
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	8
07:30 AM	0	0	0	1	0	0	0	0	0	0	0	0	1	8
07:45 AM	1	0	0	0	0	0	0	0	0	0	1	0	2	10
08:00 AM	0	0	1	0	3	0	0	0	0	0	0	1	5	9
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	6
08:30 AM	0	0	0	0	2	0	0	0	0	0	0	1	3	7
08:45 AM	0	0	1	0	0	0	0	0	0	0	0	0	1	5
09:00 AM	0	0	0	1	1	0	0	0	0	0	0	0	2	6
09:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	6
09:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	5
09:45 AM	0	0	0	0	0	0	0	0	0	0	2	0	2	5
10:00 AM	0	0	0	0	2	0	0	0	0	0	0	0	2	4
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
10:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	2
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	2
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	3
11:45 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	3
12:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	4
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	1	4
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	2	2	5
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
01:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	1	5
01:30 PM	0	0	0	0	1	0	0	0	0	0	0	1	2	6
01:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	5
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	1	7
02:15 PM	1	0	0	0	0	0	0	0	0	0	1	0	2	7
02:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	5
02:45 PM	0	0	0	0	0	0	0	0	0	0	2	1	3	4
03:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	3
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
03:45 PM	1	0	0	1	0	0	0	0	0	0	0	0	2	2
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	

File Name: Intersection #5 vehiculos
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Local Roads

	SB			SB Dirt				WB			NB				EB				
Start Time	Right	Thru	Left	Right	Right SB	Thru	Left	Right	Thru	Left	Right	Thru	Thru Dirt	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	1	0	0	0	0	0	0	1	2	1	0	0	1	1	5	0	12	42
06:15 AM	0	0	1	0	0	0	0	0	0	1	4	1	0	0	1	0	0	8	41
06:30 AM	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	0	9	47
06:45 AM	0	0	0	0	0	0	0	0	0	9	2	0	1	0	1	0	0	13	52
07:00 AM	0	0	0	0	0	0	0	0	0	2	3	0	2	2	2	0	0	11	56
07:15 AM	0	2	0	0	0	0	0	0	0	1	6	0	0	2	3	0	0	14	57
07:30 AM	0	1	0	0	0	0	0	0	1	4	5	1	0	1	1	0	0	14	64
07:45 AM	0	1	0	0	1	1	0	0	0	7	5	1	0	0	0	1	0	17	77
08:00 AM	0	1	0	0	0	0	0	0	0	4	5	0	0	1	0	0	1	12	76
08:15 AM	0	0	1	0	0	0	0	0	0	6	13	1	0	0	0	0	0	21	81
08:30 AM	0	0	0	1	0	0	0	1	0	11	10	0	1	1	1	0	1	27	74
08:45 AM	0	1	0	0	0	2	0	0	0	6	5	0	1	0	1	0	0	16	66
09:00 AM	0	0	0	0	0	0	0	0	0	6	8	0	0	1	2	0	0	17	69
09:15 AM	0	0	0	0	0	0	0	0	0	7	6	0	0	0	1	0	0	14	73
09:30 AM	0	6	0	0	1	0	0	0	0	5	3	1	2	0	1	0	0	19	72
09:45 AM	0	0	0	0	0	2	0	0	0	7	7	0	1	2	0	0	0	19	75
10:00 AM	0	1	3	0	0	1	0	2	0	6	6	0	1	0	1	0	0	21	81
10:15 AM	0	0	0	0	0	0	0	0	0	5	4	1	0	3	0	0	0	13	73
10:30 AM	0	2	0	0	0	1	0	0	1	7	6	2	0	1	2	0	0	22	74
10:45 AM	0	1	1	0	0	0	0	2	1	8	9	1	0	0	2	0	0	25	65
11:00 AM	0	1	0	0	0	1	0	1	1	3	4	1	0	1	0	0	0	13	55
11:15 AM	0	1	0	0	0	2	0	0	0	4	2	1	1	1	2	0	0	14	56
11:30 AM	0	0	1	0	0	0	0	0	1	6	3	2	0	0	0	0	0	13	53
11:45 AM	0	0	0	0	0	0	0	0	2	5	4	2	0	1	1	0	0	15	53
12:00 PM	0	1	0	0	0	2	0	1	0	4	3	1	1	0	1	0	0	14	48
12:15 PM	0	1	0	0	0	1	0	0	0	3	2	0	2	0	2	0	0	11	65
12:30 PM	0	1	1	0	0	2	0	1	1	2	3	1	0	1	0	0	0	13	66
12:45 PM	0	0	1	0	0	0	0	0	0	3	5	1	0	0	0	0	0	10	67
01:00 PM	4	1	0	0	0	2	0	0	1	5	8	2	1	3	1	0	3	31	75
01:15 PM	0	0	0	0	0	0	0	0	0	5	4	0	2	1	0	0	0	12	64
01:30 PM	0	1	0	0	0	0	0	0	2	6	3	1	0	0	1	0	0	14	71
01:45 PM	0	0	1	0	0	1	0	0	1	9	5	0	0	1	0	0	0	18	78
02:00 PM	0	0	0	0	0	1	0	0	0	10	8	0	1	0	0	0	0	20	87
02:15 PM	0	1	0	0	0	1	0	0	0	4	7	1	2	0	3	0	0	19	87
02:30 PM	0	1	0	0	0	1	0	0	1	10	5	0	2	0	0	0	1	21	109
02:45 PM	0	1	0	0	0	2	0	0	0	11	5	3	1	4	0	0	0	27	110
03:00 PM	0	0	0	0	0	2	0	0	0	6	10	0	0	1	1	0	0	20	103
03:15 PM	0	0	0	0	0	0	0	0	2	15	18	0	0	2	2	1	1	41	110
03:30 PM	0	0	0	0	0	0	0	0	0	13	6	0	1	2	0	0	0	22	84
03:45 PM	0	1	0	0	0	1	0	0	0	2	10	2	0	3	1	0	0	20	79
04:00 PM	0	4	0	0	0	3	0	0	1	7	5	2	1	3	1	0	0	27	75
04:15 PM	0	2	0	0	0	0	0	0	0	7	1	1	0	2	2	0	0	15	64
04:30 PM	0	0	0	0	0	2	0	0	0	3	4	1	2	4	0	0	1	17	70
04:45 PM	0	1	2	0	0	0	0	4	0	3	4	0	0	0	0	2	0	16	73
05:00 PM	0	1	0	0	0	1	0	0	0	4	3	2	0	2	3	0	0	16	69
05:15 PM	0	0	0	0	0	0	0	0	0	5	9	1	0	2	3	1	0	21	
05:30 PM	0	5	0	0	0	0	0	0	0	5	5	2	0	1	2	0	0	20	
05:45 PM	0	0	0	0	0	0	0	0	1	3	4	1	0	2	1	0	0	12	

File Name: Camiones #5
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Local Roads

	SB			WB			NB				EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Thru Dirt	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
06:30 AM	0	0	0	0	0	0	0	0	0	1	2	0	0	3	4
06:45 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
08:00 AM	0	0	0	0	0	0	0	0	0	1	1	0	0	2	2
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
09:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	1	4
09:30 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	1	3
09:45 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	1	3
10:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	1	2
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
10:30 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	1	4
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
11:30 AM	1	0	0	0	0	0	0	0	0	0	0	0	0	1	7
11:45 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	2	7
12:00 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	1	5
12:15 PM	0	0	0	0	0	2	1	0	0	0	0	0	0	3	5
12:30 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
01:00 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	1	3
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
01:30 PM	0	0	0	0	0	1	0	0	1	0	0	0	0	2	2
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
04:30 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	2	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

File Name: Ciclistas #5
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Local Roads

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
06:15 AM	0	0	0	0	0	1	0	0	0	0	0	0	1	1
06:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	1
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:45 PM	0	0	0	0	0	0	1	0	0	0	0	0	1	1
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
02:15 PM	0	0	0	0	0	0	1	0	0	0	0	0	1	1
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
05:15 PM	1	1	0	0	0	0	0	0	0	0	0	0	2	
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	

File Name: Intersection #6 vehiculos
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Local Road

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	0	0	0	3	0	1	0	0	1	5	0	10	36
06:15 AM	0	0	0	0	0	0	0	0	0	1	5	0	6	33
06:30 AM	0	0	0	0	4	0	0	0	2	1	3	0	10	34
06:45 AM	1	0	0	0	6	0	0	0	1	1	1	0	10	36
07:00 AM	0	0	0	0	2	0	1	0	1	1	2	0	7	39
07:15 AM	0	0	0	0	0	1	0	0	0	1	5	0	7	46
07:30 AM	0	0	0	0	6	0	0	0	1	3	2	0	12	57
07:45 AM	0	0	0	0	7	0	0	0	0	2	4	0	13	60
08:00 AM	0	0	0	0	7	0	0	0	1	1	5	0	14	55
08:15 AM	1	0	0	0	2	0	0	1	3	5	5	1	18	57
08:30 AM	0	0	0	0	3	0	1	0	2	1	8	0	15	56
08:45 AM	0	0	0	0	3	0	1	0	0	2	2	0	8	51
09:00 AM	0	0	0	0	4	0	0	0	3	4	5	0	16	57
09:15 AM	0	0	0	0	6	0	0	0	4	2	5	0	17	54
09:30 AM	0	0	0	0	5	1	0	0	1	1	2	0	10	49
09:45 AM	0	0	0	0	5	0	0	0	2	2	5	0	14	63
10:00 AM	0	0	0	0	6	1	0	0	0	3	3	0	13	61
10:15 AM	0	0	0	0	3	0	0	0	4	0	5	0	12	57
10:30 AM	1	1	1	0	11	0	0	0	1	3	5	1	24	56
10:45 AM	0	0	0	0	4	0	1	0	3	1	3	0	12	41
11:00 AM	0	0	0	0	3	0	0	0	2	1	3	0	9	39
11:15 AM	0	0	0	0	2	0	1	0	3	1	4	0	11	40
11:30 AM	0	0	0	0	3	0	0	0	1	2	3	0	9	42
11:45 AM	0	0	0	0	4	0	0	0	1	0	4	1	10	48
12:00 PM	0	1	0	0	3	1	0	0	0	2	3	0	10	47
12:15 PM	0	0	0	0	8	0	0	0	1	2	2	0	13	54
12:30 PM	0	0	1	0	6	0	1	0	2	3	1	1	15	53
12:45 PM	0	0	0	0	4	0	0	0	3	1	1	0	9	48
01:00 PM	0	1	0	0	6	1	0	0	2	2	5	0	17	52
01:15 PM	0	0	0	0	2	0	0	0	1	0	8	1	12	59
01:30 PM	0	0	0	0	4	1	1	0	0	1	3	0	10	57
01:45 PM	0	0	0	0	7	0	0	0	2	1	3	0	13	63
02:00 PM	0	0	1	0	11	0	2	1	0	4	4	1	24	66
02:15 PM	0	0	0	0	2	0	0	0	3	2	3	0	10	54
02:30 PM	0	0	0	0	10	1	0	0	1	1	3	0	16	62
02:45 PM	0	0	0	0	8	1	0	0	1	3	2	1	16	80
03:00 PM	0	0	0	0	4	0	0	0	1	2	5	0	12	77
03:15 PM	1	0	0	0	6	0	0	0	2	1	7	1	18	84
03:30 PM	0	0	0	0	15	0	0	0	5	1	13	0	34	76
03:45 PM	0	0	0	0	3	0	0	0	2	3	4	1	13	47
04:00 PM	0	0	0	0	5	0	2	0	3	4	5	0	19	48
04:15 PM	0	1	0	0	5	0	0	0	0	0	4	0	10	36
04:30 PM	0	0	0	0	2	0	0	0	2	0	1	0	5	36
04:45 PM	0	0	0	0	3	0	0	0	0	1	10	0	14	43
05:00 PM	0	0	0	0	2	0	0	0	1	0	4	0	7	38
05:15 PM	1	0	0	0	2	0	0	0	1	1	5	0	10	
05:30 PM	1	0	0	0	5	0	0	0	0	3	3	0	12	
05:45 PM	1	0	0	0	4	0	0	0	1	2	1	0	9	

File Name: Camiones #6
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Local Road

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
06:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	2
06:45 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
07:30 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
08:00 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	2
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
09:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	4
09:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	3
09:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	2
10:00 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	1
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	3
12:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
12:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	6
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
01:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	2	6
01:15 PM	0	0	0	0	3	0	0	0	0	0	0	0	3	4
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
01:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	2
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
02:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	1
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	

File Name: Ciclistas #6
Start Date: 26/08/2014
Start Time: 06:00:00 a.m.
Site Code: PR-250 with Local Road

	SB			WB			NB			EB				
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	15-Min Totals	1 Hour Totals
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
06:15 AM	0	0	0	0	1	0	0	0	0	0	0	0	1	1
06:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	1
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	1
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1
01:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	1
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	

Appendix B – Intersections' Pictures

Photo 1: Intersection #1 Northbound Approach

Photo 2: Intersection #1 Southbound Approach

Photo 3: Intersection #1 Eastbound Approach

Photo 4: Intersection #1 Westbound Approach

Photo 5: Intersection #2 Northbound and Southbound Approaches

Photo 6: Intersection #2 Northbound Approach

Photo 7: Intersection #2 Southbound Approach

Photo 8: Intersection #3 Northbound Approach

Photo 9: Intersection #3 Southbound Approach

Photo 10: Intersection #3 Eastbound Approach

Photo 11: Intersection #3 Westbound Approach

Photo 12: Intersection #4 Southbound Approach

Photo 13: Intersection #4 Eastbound Approach

Photo 14: Intersection #4 Westbound Approach

Photo 15: Intersection #5 Northbound Approach

Photo 16: Intersection #5 Southbound (Left) and Southbound Dirt (Right) Approaches

Photo 17: Intersection #5 Eastbound Approach

Photo 18: Intersection #5 Westbound Approach

Photo 19: Intersection #6 Northbound Approach

Photo 20: Intersection #6 Southbound Approach

Photo 21: Intersection #6 Eastbound Approach

Photo 22: Intersection #6 Westbound Approach

Appendix C – Results (HCS2010) (SEE CD ATTACHED)

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Imapct Study Existing Condition AM - Int. 1
East/West Street: PR-250 (Calle Pedro Márquez)
North/South Street: PR-250 (calle Escudero)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	14	50	3			
Peak-Hour Factor, PHF	0.50	0.69	0.38			
Hourly Flow Rate, HFR	28	72	7			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				
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	1	96	5	9
Peak Hour Factor, PHF	0.90	0.25	0.25	0.62	0.63	0.50
Hourly Flow Rate, HFR	0	4	4	154	7	18
Percent Heavy Vehicles	0	0	0	0	0	11
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR			LTR			LTR	
v (vph)	28			8			179	
C(m) (vph)	1636			853			838	
v/c	0.02			0.01			0.21	
95% queue length	0.05			0.03			0.81	
Control Delay	7.2			9.3			10.5	
LOS	A			A			B	
Approach Delay				9.3			10.5	
Approach LOS				A			B	

```
                    HCS+: Unsignalized Intersections Release 5.6




Phone:                                        Fax:
E-Mail:

_____________________TWO-WAY STOP CONTROL(TWSC) ANALYSIS____________________

Analyst:             Vanessa Amado
Agency/Co.:          VAGTEC
Date Performed:      9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection:        1
Jurisdiction:        Culebra
Units: U. S. Customary
Analysis Year:       2014
Project ID:  Culebra Transit Imapct Study Existing  Condition AM - Int. 1
East/West Street:    PR-250 (Calle Pedro Márquez)
North/South Street:  PR-250 (calle Escudero)
Intersection Orientation: NS               Study period (hrs):  0.25

_______________________Vehicle Volumes and Adjustments______________________
Major Street Movements      1      2      3      4      5      6
                            L      T      R      L      T      R
____________________________________________________________________________
Volume                     14     50     3
Peak-Hour Factor, PHF      0.50   0.69   0.38
Peak-15 Minute Volume      7      18     2
Hourly Flow Rate, HFR      28     72     7
Percent Heavy Vehicles     0      --     --            --     --
Median Type/Storage         Undivided           /
RT Channelized?
Lanes                         0   1    0
Configuration                  LTR
Upstream Signal?                  No                   No
____________________________________________________________________________
Minor Street Movements      7      8      9      10     11     12
                            L      T      R      L      T      R
____________________________________________________________________________
Volume                     0      1      1      96     5      9
Peak Hour Factor, PHF      0.90   0.25   0.25   0.62   0.63   0.50
Peak-15 Minute Volume      0      1      1      39     2      4
Hourly Flow Rate, HFR      0      4      4      154    7      18
Percent Heavy Vehicles     0      0      0      0      0      11
Percent Grade (%)                 0                    0
Flared Approach:  Exists?/Storage        No     /             No     /
RT Channelized?
Lanes                         0   1    0          0   1    0
Configuration                     LTR                  LTR
____________________________________________________________________________

_____________________Pedestrian Volumes and Adjustments_____________________
Movements                    13     14     15     16
____________________________________________________________________________
Flow (ped/hr)                0      0      0      0
```

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	72	
Shared ln volume, major rt vehicles:	7	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1		7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0		0	0	0	0	0	11
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00		0.00	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		7.1	6.5	6.2	7.1	6.5	6.3
	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	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0		0	0	0	0	0	11
t(f)	2.2		3.5	4.0	3.3	3.5	4.0	3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

Computation 2-Proportion of TWSC Intersection Time blocked

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	0		144	132	76	136	135	0
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		0		0		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	76	0
Potential Capacity	991	1059
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	991	1059
Probability of Queue free St.	1.00	0.98

Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.98

Step 3: TH from Minor St.	8	11
Conflicting Flows	132	135
Potential Capacity	762	760
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	748	746
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	144	136
Potential Capacity	830	840
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.98
Maj. L, Min T Adj. Imp Factor.	0.98	0.98
Cap. Adj. factor due to Impeding mvmnt	0.96	0.98
Movement Capacity	799	822

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	132	135
Potential Capacity	762	760
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	748	746
Result for 2 stage process:		
a		
y		
C t	748	746
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	144	136
Potential Capacity	830	840
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.98
Maj. L, Min T Adj. Imp Factor.	0.98	0.98
Cap. Adj. factor due to Impeding mvmnt	0.96	0.98
Movement Capacity	799	822
Results for Two-stage process:		
a		
y		
C t	799	822

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	0	4	4	154	7	18
Movement Capacity (vph)	799	748	991	822	746	1059
Shared Lane Capacity (vph)		853			838	

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	799	748	991	822	746	1059
Volume	0	4	4	154	7	18
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		853			838	
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			LTR			LTR	
v (vph)	28			8			179	
C(m) (vph)	1636			853			838	
v/c	0.02			0.01			0.21	
95% queue length	0.05			0.03			0.81	
Control Delay	7.2			9.3			10.5	
LOS	A			A			B	
Approach Delay				9.3			10.5	
Approach LOS				A			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	72	
v(i2), Volume for stream 3 or 6	7	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 2
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Imapct Study Existing Condition AM - Int. 2
East/West Street: PR-250 (Salisberry Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	19	133				134
Peak-Hour Factor, PHF	0.79	0.71				0.67
Hourly Flow Rate, HFR	24	187				199
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	1				1
Configuration	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						
Peak Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes						
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT							
v (vph)	24							
C(m) (vph)	1385							
v/c	0.02							
95% queue length	0.05							
Control Delay	7.6							
LOS	A							
Approach Delay								
Approach LOS								

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 2
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Imapct Study Existing Condition AM - Int. 2
East/West Street: PR-250 (Salisberry Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	19	133				134
Peak-Hour Factor, PHF	0.79	0.71				0.67
Peak-15 Minute Volume	6	47				50
Hourly Flow Rate, HFR	24	187				199
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	1				1
Configuration	LT					R
Upstream Signal?		No			No	

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

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:	187	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1							
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0							
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00							
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1							
	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							
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0							
t(f)	2.2							

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	199							
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								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		199
Potential Capacity		1385
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1385
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		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		

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

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

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

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

Results for Two-stage process:
a
y
C t

Worksheet 8-Shared Lane Calculations

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

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
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							
v (vph)	24							
C(m) (vph)	1385							
v/c	0.02							
95% queue length	0.05							
Control Delay	7.6							
LOS	A							
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	187	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
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	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition AM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	18	59	55	33	48	14
Peak-Hour Factor, PHF	0.50	0.67	0.81	1.00	0.73	0.70
Hourly Flow Rate, HFR	36	88	67	33	65	20
Percent Heavy Vehicles	0	--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	59	8	43	12	8	35
Peak Hour Factor, PHF	0.78	0.58	0.63	0.75	0.58	0.44
Hourly Flow Rate, HFR	75	13	68	16	13	79
Percent Heavy Vehicles	0	13	0	0	13	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	36	33		156			108	
C(m) (vph)	1550	1419		637			794	
v/c	0.02	0.02		0.24			0.14	
95% queue length	0.07	0.07		0.96			0.47	
Control Delay	7.4	7.6		12.5			10.2	
LOS	A	A		B			B	
Approach Delay				12.5			10.2	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition AM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	18	59	55	33	48	14
Peak-Hour Factor, PHF	0.50	0.67	0.81	1.00	0.73	0.70
Peak-15 Minute Volume	9	22	17	8	16	5
Hourly Flow Rate, HFR	36	88	67	33	65	20
Percent Heavy Vehicles	0	--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	59	8	43	12	8	35
Peak Hour Factor, PHF	0.78	0.58	0.63	0.75	0.58	0.44
Peak-15 Minute Volume	19	3	17	4	3	20
Hourly Flow Rate, HFR	75	13	68	16	13	79
Percent Heavy Vehicles	0	13	0	0	13	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	88	65
Shared ln volume, major rt vehicles:	67	20
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	3	0	13	0	0	13	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.6	6.2	7.1	6.6	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	3	0	13	0	0	13	0
t(f)	2.2	2.2	3.5	4.1	3.3	3.5	4.1	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	65	155	381	325	122	375	368	75
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	122	75
Potential Capacity	935	992
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	935	992
Probability of Queue free St.	0.93	0.92

Step 2: LT from Major St.	4	1
Conflicting Flows	155	65
Potential Capacity	1419	1550
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1419	1550
Probability of Queue free St.	0.98	0.98
Maj L-Shared Prob Q free St.	0.98	0.97

Step 3: TH from Minor St.	8	11
Conflicting Flows	325	368
Potential Capacity	575	544
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity	547	517
Probability of Queue free St.	0.98	0.97

Step 4: LT from Minor St.	7	10
Conflicting Flows	381	375
Potential Capacity	581	586
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.93	0.93
Maj. L, Min T Adj. Imp Factor.	0.94	0.94
Cap. Adj. factor due to Impeding mvmnt	0.87	0.88
Movement Capacity	505	513

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	325	368
Potential Capacity	575	544
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity	547	517
Result for 2 stage process:		
a		
y		
C t	547	517
Probability of Queue free St.	0.98	0.97

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	381	375
Potential Capacity	581	586
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.93	0.93
Maj. L, Min T Adj. Imp Factor.	0.94	0.94
Cap. Adj. factor due to Impeding mvmnt	0.87	0.88
Movement Capacity	505	513
Results for Two-stage process:		
a		
y		
C t	505	513

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	75	13	68	16	13	79
Movement Capacity (vph)	505	547	935	513	517	992
Shared Lane Capacity (vph)		637			794	

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	505	547	935	513	517	992
Volume	75	13	68	16	13	79
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		637			794	
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	LTR		LTR			LTR	
v (vph)	36	33		156			108	
C(m) (vph)	1550	1419		637			794	
v/c	0.02	0.02		0.24			0.14	
95% queue length	0.07	0.07		0.96			0.47	
Control Delay	7.4	7.6		12.5			10.2	
LOS	A	A		B			B	
Approach Delay				12.5			10.2	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	0.98
v(il), Volume for stream 2 or 5	88	65
v(i2), Volume for stream 3 or 6	67	20
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.97	0.98
d(M,LT), Delay for stream 1 or 4	7.4	7.6
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.2	0.2

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition AM - Int.4
East/West Street: PR-250
North/South Street: Resaca Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	25	67			78	12
Peak-Hour Factor, PHF	0.60	0.75			0.73	0.60
Hourly Flow Rate, HFR	41	89			106	19
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				3		27
Peak Hour Factor, PHF				0.38		0.61
Hourly Flow Rate, HFR				7		44
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	41						51	
C(m) (vph)	1449						897	
v/c	0.03						0.06	
95% queue length	0.09						0.18	
Control Delay	7.6						9.3	
LOS	A						A	
Approach Delay							9.3	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition AM - Int.4
East/West Street: PR-250
North/South Street: Resaca Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	25	67			78	12
Peak-Hour Factor, PHF	0.60	0.75			0.73	0.60
Peak-15 Minute Volume	10	22			27	5
Hourly Flow Rate, HFR	41	89			106	19
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	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				3		27
Peak Hour Factor, PHF				0.38		0.61
Peak-15 Minute Volume				2		11
Hourly Flow Rate, HFR				7		44
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	89	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		4					0		0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1					6.4		6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	4					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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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                  (1)             (2)             (3)
for minor              Single-stage         Two-Stage Process
movements, p(x)          Process       Stage I         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                  125                                287           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						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		116
Potential Capacity		942
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		942
Probability of Queue free St.	1.00	0.95

Step 2: LT from Major St.	4	1
Conflicting Flows		125
Potential Capacity		1449
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1449
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		287
Potential Capacity		708
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	0.93	0.97
Movement Capacity		688

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                                                287
Potential Capacity                                               708
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          0.93             0.97
Movement Capacity                                                688
______________________________________________________________________________
Results for Two-stage process:
a
y
C t                                                              688
______________________________________________________________________________

Worksheet 8-Shared Lane Calculations
______________________________________________________________________________
Movement                              7      8      9     10     11     12
                                      L      T      R      L      T      R

______________________________________________________________________________
Volume (vph)                                              7             44
Movement Capacity (vph)                                   688           942
Shared Lane Capacity (vph)                                       897
______________________________________________________________________________
```

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				688		942
Volume				7		44
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					897	
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)	41						51	
C(m) (vph)	1449						897	
v/c	0.03						0.06	
95% queue length	0.09						0.18	
Control Delay	7.6						9.3	
LOS	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(il), Volume for stream 2 or 5	89	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
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	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition AM - Int 5
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	0	5	27	2	4
Peak-Hour Factor, PHF	0.90	0.90	0.63	0.81	0.50	0.50
Hourly Flow Rate, HFR	0	0	7	33	4	8
Percent Heavy Vehicles	0	--	--	4	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	4	6	25	4	6	0
Peak Hour Factor, PHF	0.33	0.50	0.69	0.33	0.50	0.90
Hourly Flow Rate, HFR	12	12	36	12	12	0
Percent Heavy Vehicles	0	17	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	33		60			24	
C(m) (vph)	1620	1601		960			813	
v/c	0.00	0.02		0.06			0.03	
95% queue length	0.00	0.06		0.20			0.09	
Control Delay	7.2	7.3		9.0			9.6	
LOS	A	A		A			A	
Approach Delay				9.0			9.6	
Approach LOS				A			A	

HCS+: Unsignalized Intersections Release 5.6

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

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition AM - Int 5
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	0	5	27	2	4
Peak-Hour Factor, PHF	0.90	0.90	0.63	0.81	0.50	0.50
Peak-15 Minute Volume	0	0	2	8	1	2
Hourly Flow Rate, HFR	0	0	7	33	4	8
Percent Heavy Vehicles	0	--	--	4	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	4	6	25	4	6	0
Peak Hour Factor, PHF	0.33	0.50	0.69	0.33	0.50	0.90
Peak-15 Minute Volume	3	3	9	3	3	0
Hourly Flow Rate, HFR	12	12	36	12	12	0
Percent Heavy Vehicles	0	17	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	4
Shared ln volume, major rt vehicles:	7	8
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	4	0	17	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.7	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	4	0	17	0	0	0	0
t(f)	2.2	2.2	3.5	4.2	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	12	7	84	82	4	102	81	8
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	4	8
Potential Capacity	1085	1080
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1085	1080
Probability of Queue free St.	0.97	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	7	12
Potential Capacity	1601	1620
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1601	1620
Probability of Queue free St.	0.98	1.00
Maj L-Shared Prob Q free St.	0.98	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	82	81
Potential Capacity	780	813
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	764	796
Probability of Queue free St.	0.98	0.98

Step 4: LT from Minor St.	7	10
Conflicting Flows	84	102
Potential Capacity	908	884
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.96	0.96
Maj. L, Min T Adj. Imp Factor.	0.97	0.97
Cap. Adj. factor due to Impeding mvmnt	0.97	0.94
Movement Capacity	883	831

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	82	81
Potential Capacity	780	813
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	764	796

Result for 2 stage process:		
a		
y		
C t	764	796
Probability of Queue free St.	0.98	0.98

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	84	102
Potential Capacity	908	884
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.96	0.96
Maj. L, Min T Adj. Imp Factor.	0.97	0.97
Cap. Adj. factor due to Impeding mvmnt	0.97	0.94
Movement Capacity	883	831

Results for Two-stage process:		
a		
y		
C t	883	831

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	12	12	36	12	12	0
Movement Capacity (vph)	883	764	1085	831	796	1080
Shared Lane Capacity (vph)		960			813	

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	883	764	1085	831	796	1080
Volume	12	12	36	12	12	0
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		960			813	
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	LTR		LTR			LTR	
v (vph)	0	33		60			24	
C(m) (vph)	1620	1601		960			813	
v/c	0.00	0.02		0.06			0.03	
95% queue length	0.00	0.06		0.20			0.09	
Control Delay	7.2	7.3		9.0			9.6	
LOS	A	A		A			A	
Approach Delay				9.0			9.6	
Approach LOS				A			A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5	0	4
v(i2), Volume for stream 3 or 6	7	8
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.98
d(M,LT), Delay for stream 1 or 4	7.2	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.2

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition AM - Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	16	7	1	25	0
Peak-Hour Factor, PHF	0.25	0.80	0.58	0.25		0.90
Hourly Flow Rate, HFR	4	19	12	4	92	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	8	0	1	1	1	1
Peak Hour Factor, PHF	0.50	0.90	0.25	0.25	0.25	0.25
Hourly Flow Rate, HFR	16	0	4	4	4	4
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	4	4		20			12	
C(m) (vph)	1515	1595		866			843	
v/c	0.00	0.00		0.02			0.01	
95% queue length	0.01	0.01		0.07			0.04	
Control Delay	7.4	7.3		9.3			9.3	
LOS	A	A		A			A	
Approach Delay				9.3			9.3	
Approach LOS				A			A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition AM - Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	1	16	7	1	25	0
Peak-Hour Factor, PHF	0.25	0.80	0.58	0.25		0.90
Peak-15 Minute Volume	1	5	3	1	23	0
Hourly Flow Rate, HFR	4	19	12	4	92	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	8	0	1	1	1	1
Peak Hour Factor, PHF	0.50	0.90	0.25	0.25	0.25	0.25
Peak-15 Minute Volume	4	0	1	1	1	1
Hourly Flow Rate, HFR	16	0	4	4	4	4
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	19	92
Shared ln volume, major rt vehicles:	12	0
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

Computation 2-Proportion of TWSC Intersection Time blocked

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	92	31	137	133	25	135	139	92
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	25	92
Potential Capacity	1057	971
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1057	971
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	31	92
Potential Capacity	1595	1515
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1595	1515
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	133	139
Potential Capacity	761	756
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	757	752
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	137	135
Potential Capacity	838	841
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	0.99
Maj. L, Min T Adj. Imp Factor.	0.99	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	828	834

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	133	139
Potential Capacity	761	756
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	757	752

Result for 2 stage process:		
a		
y		
C t	757	752
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10

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

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

Part 3 - Single Stage		
Conflicting Flows	137	135
Potential Capacity	838	841
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	0.99
Maj. L, Min T Adj. Imp Factor.	0.99	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	828	834

Results for Two-stage process:		
a		
y		
C t	828	834

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	16	0	4	4	4	4
Movement Capacity (vph)	828	757	1057	834	752	971
Shared Lane Capacity (vph)		866			843	

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	828	757	1057	834	752	971
Volume	16	0	4	4	4	4
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		866			843	
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	LTR		LTR			LTR	
v (vph)	4	4		20			12	
C(m) (vph)	1515	1595		866			843	
v/c	0.00	0.00		0.02			0.01	
95% queue length	0.01	0.01		0.07			0.04	
Control Delay	7.4	7.3		9.3			9.3	
LOS	A	A		A			A	
Approach Delay				9.3			9.3	
Approach LOS				A			A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	19	92
v(i2), Volume for stream 3 or 6	12	0
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	1.00
d(M,LT), Delay for stream 1 or 4	7.4	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM - Int. 1
East/West Street: PR-250 (Pedro Márquez Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9		2			
Peak-Hour Factor, PHF	0.75	0.75	0.50			
Hourly Flow Rate, HFR	12	108	4			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	3	125	1	10
Peak Hour Factor, PHF	0.90	0.90	0.38	0.74	0.25	0.83
Hourly Flow Rate, HFR	0	0	7	168	4	12
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR			LTR			LTR	
v (vph)	12			7			184	
C(m) (vph)	1636			949			838	
v/c	0.01			0.01			0.22	
95% queue length	0.02			0.02			0.84	
Control Delay	7.2			8.8			10.5	
LOS	A			A			B	
Approach Delay				8.8			10.5	
Approach LOS				A			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM - Int. 1
East/West Street: PR-250 (Pedro Márquez Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9		2			
Peak-Hour Factor, PHF	0.75	0.75	0.50			
Peak-15 Minute Volume	3	27	1			
Hourly Flow Rate, HFR	12	108	4			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	3	125	1	10
Peak Hour Factor, PHF	0.90	0.90	0.38	0.74	0.25	0.83
Peak-15 Minute Volume	0	0	2	42	1	3
Hourly Flow Rate, HFR	0	0	7	168	4	12
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	108	
Shared ln volume, major rt vehicles:	4	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1		7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0		0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00		0.00	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		7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20		3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0		0	0	0	0	0	0
t(f)	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

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

Computation 2-Proportion of TWSC Intersection Time blocked

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	0		142	134	110	138	136	0
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		0		0		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	110	0
Potential Capacity	949	1091
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	949	1091
Probability of Queue free St.	0.99	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99

Step 3: TH from Minor St.	8	11
Conflicting Flows	134	136
Potential Capacity	760	759
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	754	753
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	142	138
Potential Capacity	832	837
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	0.99
Maj. L, Min T Adj. Imp Factor.	0.99	0.99
Cap. Adj. factor due to Impeding mvmnt	0.98	0.99
Movement Capacity	815	826

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	134	136
Potential Capacity	760	759
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	754	753

Result for 2 stage process:		
a		
y		
C t	754	753
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10

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

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

Part 3 - Single Stage		
Conflicting Flows	142	138
Potential Capacity	832	837
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	0.99
Maj. L, Min T Adj. Imp Factor.	0.99	0.99
Cap. Adj. factor due to Impeding mvmnt	0.98	0.99
Movement Capacity	815	826

Results for Two-stage process:		
a		
y		
C t	815	826

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	0	0	7	168	4	12
Movement Capacity (vph)	815	754	949	826	753	1091
Shared Lane Capacity (vph)		949			838	

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	815	754	949	826	753	1091
Volume	0	0	7	168	4	12
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		949			838	
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			LTR			LTR	
v (vph)	12			7			184	
C(m) (vph)	1636			949			838	
v/c	0.01			0.01			0.22	
95% queue length	0.02			0.02			0.84	
Control Delay	7.2			8.8			10.5	
LOS	A			A			B	
Approach Delay				8.8			10.5	
Approach LOS				A			B	

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	108	
v(i2), Volume for stream 3 or 6	4	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

```
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_______________________TWO-WAY STOP CONTROL SUMMARY___________________________

Analyst:               Vanessa Amado
Agency/Co.:            VAGTEC
Date Performed:        9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection:          2
Jurisdiction:          Culebra
Units: U. S. Customary
Analysis Year:         2014
Project ID:  Culebra Transit Impact Study Existing Condition PM - Int. 2
East/West Street:      PR-250 (Salisberry Street)
North/South Street:    PR-250 (Escudero Street)
Intersection Orientation: NS                Study period (hrs):  0.25

______________________Vehicle Volumes and Adjustments_________________________
Major Street:  Approach        Northbound              Southbound
               Movement     1      2      3     |  4      5      6
                            L      T      R     |  L      T      R
______________________________________________________________________________
Volume                      14     212                           181
Peak-Hour Factor, PHF       0.46   0.86                          0.87
Hourly Flow Rate, HFR       30     246                           208
Percent Heavy Vehicles      7      --     --              --     --
Median Type/Storage         Undivided            /
RT Channelized?                                             No
Lanes                          0   1                         1
Configuration                   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
Peak Hour Factor, PHF
Hourly Flow Rate, HFR
Percent Heavy Vehicles
Percent Grade (%)                  0                      0
Flared Approach:  Exists?/Storage               /                     /
Lanes
Configuration
______________________________________________________________________________

_________________Delay, Queue Length, and Level of Service___________________
Approach              NB     SB         Westbound            Eastbound
Movement              1      4   |  7      8      9    |  10     11     12
Lane Config           LT         |                     |
______________________________________________________________________________
v (vph)               30
C(m) (vph)            1334
v/c                   0.02
95% queue length      0.07
Control Delay         7.8
LOS                    A
Approach Delay
Approach LOS
______________________________________________________________________________
```

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 2
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM - Int. 2
East/West Street: PR-250 (Salisberry Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	14	212				181
Peak-Hour Factor, PHF	0.46	0.86				0.87
Peak-15 Minute Volume	8	62				52
Hourly Flow Rate, HFR	30	246				208
Percent Heavy Vehicles	7	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	1				1
Configuration		LT				R
Upstream Signal?		No			No	

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

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:	246	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1							
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	7							
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00							
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.2							
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							
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	7							
t(f)	2.3							

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	208							
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								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		208
Potential Capacity		1334
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1334
Probability of Queue free St.	1.00	0.98
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		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		

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

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

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

Part 3 - Single Stage

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

Results for Two-stage process:
a
y
C t

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)						
Movement Capacity (vph)						
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						
Volume						
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							
v (vph)	30							
C(m) (vph)	1334							
v/c	0.02							
95% queue length	0.07							
Control Delay	7.8							
LOS	A							
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	246	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
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	0.2	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	42	70	82	41		16
Peak-Hour Factor, PHF	0.70	0.67	0.81	0.79	0.78	0.57
Hourly Flow Rate, HFR	60	104	101	51	79	28
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	65	15	46	12	15	26
Peak Hour Factor, PHF	0.90	0.63	0.77	0.75	0.63	0.81
Hourly Flow Rate, HFR	72	23	59	16	23	32
Percent Heavy Vehicles	0	0	2	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	60	51		154			71	
C(m) (vph)	1497	1378		535			558	
v/c	0.04	0.04		0.29			0.13	
95% queue length	0.13	0.12		1.18			0.43	
Control Delay	7.5	7.7		14.4			12.4	
LOS	A	A		B			B	
Approach Delay				14.4			12.4	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	42	70	82	41		16
Peak-Hour Factor, PHF	0.70	0.67	0.81	0.79	0.78	0.57
Peak-15 Minute Volume	15	26	25	13	20	7
Hourly Flow Rate, HFR	60	104	101	51	79	28
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	65	15	46	12	15	26
Peak Hour Factor, PHF	0.90	0.63	0.77	0.75	0.63	0.81
Peak-15 Minute Volume	18	6	15	4	6	8
Hourly Flow Rate, HFR	72	23	59	16	23	32
Percent Heavy Vehicles	0	0	2	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	104	79
Shared ln volume, major rt vehicles:	101	28
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	2	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	2	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	107	205	496	483	154	511	520	93
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	154	93
Potential Capacity	892	970
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	892	970
Probability of Queue free St.	0.93	0.97

Step 2: LT from Major St.	4	1
Conflicting Flows	205	107
Potential Capacity	1378	1497
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1378	1497
Probability of Queue free St.	0.96	0.96
Maj L-Shared Prob Q free St.	0.96	0.95

Step 3: TH from Minor St.	8	11
Conflicting Flows	483	520
Potential Capacity	486	463
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity	446	424
Probability of Queue free St.	0.95	0.95

Step 4: LT from Minor St.	7	10
Conflicting Flows	496	511
Potential Capacity	487	476
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.87	0.87
Maj. L, Min T Adj. Imp Factor.	0.90	0.90
Cap. Adj. factor due to Impeding mvmnt	0.87	0.84
Movement Capacity	423	400

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                             483               520
Potential Capacity                            486               463
Pedestrian Impedance Factor                   1.00              1.00
Cap. Adj. factor due to Impeding mvmnt        0.92              0.92
Movement Capacity                             446               424
_______________________________________________________________________________
Result for 2 stage process:
a
y
C t                                           446               424
Probability of Queue free St.                 0.95              0.95
_______________________________________________________________________________
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                             496               511
Potential Capacity                            487               476
Pedestrian Impedance Factor                   1.00              1.00
Maj. L, Min T Impedance factor                0.87              0.87
Maj. L, Min T Adj. Imp Factor.                0.90              0.90
Cap. Adj. factor due to Impeding mvmnt        0.87              0.84
Movement Capacity                             423               400
_______________________________________________________________________________
Results for Two-stage process:
a
y
C t                                           423               400
_______________________________________________________________________________

Worksheet 8-Shared Lane Calculations
_______________________________________________________________________________
Movement                             7      8      9     10     11     12
                                     L      T      R      L      T      R
_______________________________________________________________________________
Volume (vph)                        72     23     59     16     23     32
Movement Capacity (vph)            423    446    892    400    424    970
Shared Lane Capacity (vph)                535                  558
_______________________________________________________________________________
```

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	423	446	892	400	424	970
Volume	72	23	59	16	23	32
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		535			558	
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	LTR		LTR			LTR	
v (vph)	60	51		154			71	
C(m) (vph)	1497	1378		535			558	
v/c	0.04	0.04		0.29			0.13	
95% queue length	0.13	0.12		1.18			0.43	
Control Delay	7.5	7.7		14.4			12.4	
LOS	A	A		B			B	
Approach Delay				14.4			12.4	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.96	0.96
v(il), Volume for stream 2 or 5	104	79
v(i2), Volume for stream 3 or 6	101	28
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.95	0.96
d(M,LT), Delay for stream 1 or 4	7.5	7.7
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.3	0.3

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TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM - Int.4
East/West Street: PR-250
North/South Street: Calle Resaca
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	48	87			73	13
Peak-Hour Factor, PHF	0.67	0.81			0.63	0.60
Hourly Flow Rate, HFR	71	107			115	21
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				8		42
Peak Hour Factor, PHF				0.33		0.85
Hourly Flow Rate, HFR				24		49
Percent Heavy Vehicles				0		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	0	
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	71						73	
C(m) (vph)	1461						784	
v/c	0.05						0.09	
95% queue length	0.15						0.31	
Control Delay	7.6						10.1	
LOS	A						B	
Approach Delay							10.1	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM - Int.4
East/West Street: PR-250
North/South Street: Calle Resaca
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	48	87			73	13
Peak-Hour Factor, PHF	0.67	0.81			0.63	0.60
Peak-15 Minute Volume	18	27			29	5
Hourly Flow Rate, HFR	71	107			115	21
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				8		42
Peak Hour Factor, PHF				0.33		0.85
Peak-15 Minute Volume				6		12
Hourly Flow Rate, HFR				24		49
Percent Heavy Vehicles				0		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	107	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					0		2
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.4		6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		2
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

Computation 2-Proportion of TWSC Intersection Time blocked

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	136					375		126
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		126
Potential Capacity		924
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		924
Probability of Queue free St.	1.00	0.95

Step 2: LT from Major St.	4	1
Conflicting Flows		136
Potential Capacity		1461
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1461
Probability of Queue free St.	1.00	0.95
Maj L-Shared Prob Q free St.		0.95

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	0.95	0.95
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		375
Potential Capacity		630
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.95	
Maj. L, Min T Adj. Imp Factor.	0.96	
Cap. Adj. factor due to Impeding mvmnt	0.91	0.95
Movement Capacity		599

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            0.95              0.95
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                                                   375
Potential Capacity                                                  630
Pedestrian Impedance Factor                       1.00              1.00
Maj. L, Min T Impedance factor                    0.95
Maj. L, Min T Adj. Imp Factor.                    0.96
Cap. Adj. factor due to Impeding mvmnt            0.91              0.95
Movement Capacity                                                   599
_______________________________________________________________________________
Results for Two-stage process:
a
y
C t                                                                 599
_______________________________________________________________________________

Worksheet 8-Shared Lane Calculations
_______________________________________________________________________________
Movement                                     7      8      9     10     11     12
                                             L      T      R      L      T      R
_______________________________________________________________________________
Volume (vph)                                                     24            49
Movement Capacity (vph)                                          599           924
Shared Lane Capacity (vph)                                              784
_______________________________________________________________________________
```

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				599		924
Volume				24		49
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					784	
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)	71						73	
C(m) (vph)	1461						784	
v/c	0.05						0.09	
95% queue length	0.15						0.31	
Control Delay	7.6						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)	0.95	1.00
v(il), Volume for stream 2 or 5	107	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.95	
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	0.4	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM - Int.5
East/West Street: Local Rd./ PR-250 WB
North/South Street: PR-250 SB/ Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	0	5	19	1	0
Peak-Hour Factor, PHF	0.25	0.90	0.50	0.68	0.25	0.90
Hourly Flow Rate, HFR	4	0	10	27	4	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	14	9	20	0	13	0
Peak Hour Factor, PHF	0.75	0.75	0.50	0.90	0.44	0.90
Hourly Flow Rate, HFR	18	12	40	0	29	0
Percent Heavy Vehicles	7	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	4	27		70			29	
C(m) (vph)	1631	1623		960			802	
v/c	0.00	0.02		0.07			0.04	
95% queue length	0.01	0.05		0.24			0.11	
Control Delay	7.2	7.3		9.0			9.7	
LOS	A	A		A			A	
Approach Delay				9.0			9.7	
Approach LOS				A			A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM - Int.5
East/West Street: Local Rd./ PR-250 WB
North/South Street: PR-250 SB/ Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	0	5	19	1	0
Peak-Hour Factor, PHF	0.25	0.90	0.50	0.68	0.25	0.90
Peak-15 Minute Volume	1	0	2	7	1	0
Hourly Flow Rate, HFR	4	0	10	27	4	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	14	9	20	0	13	0
Peak Hour Factor, PHF	0.75	0.75	0.50	0.90	0.44	0.90
Peak-15 Minute Volume	5	3	10	0	7	0
Hourly Flow Rate, HFR	18	12	40	0	29	0
Percent Heavy Vehicles	7	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	4
Shared ln volume, major rt vehicles:	10	0
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	7	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.2	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	7	0	0	0	0	0
t(f)	2.2	2.2	3.6	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

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

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

Computation 4 and 5

Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	4	10	85	71	5	97	76	4
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	5	4
Potential Capacity	1084	1085
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1084	1085
Probability of Queue free St.	0.96	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	10	4
Potential Capacity	1623	1631
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1623	1631
Probability of Queue free St.	0.98	1.00
Maj L-Shared Prob Q free St.	0.98	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	71	76
Potential Capacity	823	818
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	807	802
Probability of Queue free St.	0.99	0.96

Step 4: LT from Minor St.	7	10
Conflicting Flows	85	97
Potential Capacity	889	890
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.95	0.97
Maj. L, Min T Adj. Imp Factor.	0.96	0.97
Cap. Adj. factor due to Impeding mvmnt	0.96	0.94
Movement Capacity	852	835

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	71	76
Potential Capacity	823	818
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	807	802
Result for 2 stage process:		
a		
y		
C t	807	802
Probability of Queue free St.	0.99	0.96

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	85	97
Potential Capacity	889	890
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.95	0.97
Maj. L, Min T Adj. Imp Factor.	0.96	0.97
Cap. Adj. factor due to Impeding mvmnt	0.96	0.94
Movement Capacity	852	835
Results for Two-stage process:		
a		
y		
C t	852	835

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	18	12	40	0	29	0
Movement Capacity (vph)	852	807	1084	835	802	1085
Shared Lane Capacity (vph)		960			802	

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	852	807	1084	835	802	1085
Volume	18	12	40	0	29	0
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		960			802	
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	LTR		LTR			LTR	
v (vph)	4	27		70			29	
C(m) (vph)	1631	1623		960			802	
v/c	0.00	0.02		0.07			0.04	
95% queue length	0.01	0.05		0.24			0.11	
Control Delay	7.2	7.3		9.0			9.7	
LOS	A	A		A			A	
Approach Delay				9.0			9.7	
Approach LOS				A			A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5	0	4
v(i2), Volume for stream 3 or 6	10	0
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.98
d(M,LT), Delay for stream 1 or 4	7.2	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	14	7	0	15	0
Peak-Hour Factor, PHF	0.25	0.70	0.44	0.90	0.75	0.90
Hourly Flow Rate, HFR	4	20	15	0	20	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	7	0	2	0	1	0
Peak Hour Factor, PHF	0.58	0.90	0.25	0.90	0.25	0.90
Hourly Flow Rate, HFR	12	0	8	0	4	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	4	0		20			4	
C(m) (vph)	1609	1589		982			830	
v/c	0.00	0.00		0.02			0.00	
95% queue length	0.01	0.00		0.06			0.01	
Control Delay	7.2	7.3		8.7			9.4	
LOS	A	A		A			A	
Approach Delay				8.7			9.4	
Approach LOS				A			A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2014
Project ID: Culebra Transit Impact Study Existing Condition PM Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	1	14	7	0	15	0
Peak-Hour Factor, PHF	0.25	0.70	0.44	0.90	0.75	0.90
Peak-15 Minute Volume	1	5	4	0	5	0
Hourly Flow Rate, HFR	4	20	15	0	20	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	7	0	2	0	1	0
Peak Hour Factor, PHF	0.58	0.90	0.25	0.90	0.25	0.90
Peak-15 Minute Volume	3	0	2	0	1	0
Hourly Flow Rate, HFR	12	0	8	0	4	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	20	20
Shared ln volume, major rt vehicles:	15	0
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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	20	35	58	56	28	60	63	20
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	28	20
Potential Capacity	1053	1064
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1053	1064
Probability of Queue free St.	0.99	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	35	20
Potential Capacity	1589	1609
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1589	1609
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.	1.00	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	56	63
Potential Capacity	839	832
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	837	830
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	58	60
Potential Capacity	944	941
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	1.00
Maj. L, Min T Adj. Imp Factor.	0.99	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	939	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	56	63
Potential Capacity	839	832
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	837	830

Result for 2 stage process:		
a		
y		
C t	837	830
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	58	60
Potential Capacity	944	941
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	1.00
Maj. L, Min T Adj. Imp Factor.	0.99	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	939	932

Results for Two-stage process:		
a		
y		
C t	939	932

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	12	0	8	0	4	0
Movement Capacity (vph)	939	837	1053	932	830	1064
Shared Lane Capacity (vph)		982			830	

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	939	837	1053	932	830	1064
Volume	12	0	8	0	4	0
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		982			830	
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	LTR		LTR			LTR	
v (vph)	4	0		20			4	
C(m) (vph)	1609	1589		982			830	
v/c	0.00	0.00		0.02			0.00	
95% queue length	0.01	0.00		0.06			0.01	
Control Delay	7.2	7.3		8.7			9.4	
LOS	A	A		A			A	
Approach Delay				8.7			9.4	
Approach LOS				A			A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	20	20
v(i2), Volume for stream 3 or 6	15	0
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	1.00
d(M,LT), Delay for stream 1 or 4	7.2	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Imapct Study Opening year 2015 AM - Int. 1
East/West Street: PR-250 (Pedro Márquez Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	7	51	3			
Peak-Hour Factor, PHF	0.50	0.69	0.38			
Hourly Flow Rate, HFR	14	73	7			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	0	1	1	48	5	9
Peak Hour Factor, PHF	0.90	0.25	0.25	0.62	0.63	0.50
Hourly Flow Rate, HFR	0	4	4	77	7	18
Percent Heavy Vehicles	0	0	0	0	0	11
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR			LTR			LTR	
v (vph)	14			8			102	
C(m) (vph)	1636			875			885	
v/c	0.01			0.01			0.12	
95% queue length	0.03			0.03			0.39	
Control Delay	7.2			9.2			9.6	
LOS	A			A			A	
Approach Delay				9.2			9.6	
Approach LOS				A			A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Imapct Study Opening year 2015 AM - Int. 1
East/West Street: PR-250 (Pedro Márquez Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	51	3			
Peak-Hour Factor, PHF	0.50	0.69	0.38			
Peak-15 Minute Volume	4	18	2			
Hourly Flow Rate, HFR	14	73	7			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0			
Configuration	LTR					
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	1	1	48	5	9
Peak Hour Factor, PHF	0.90	0.25	0.25	0.62	0.63	0.50
Peak-15 Minute Volume	0	1	1	19	2	4
Hourly Flow Rate, HFR	0	4	4	77	7	18
Percent Heavy Vehicles	0	0	0	0	0	11
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	73	
Shared ln volume, major rt vehicles:	7	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1		7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0		0	0	0	0	0	11
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00		0.00	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		7.1	6.5	6.2	7.1	6.5	6.3
	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	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0		0	0	0	0	0	11
t(f)	2.2		3.5	4.0	3.3	3.5	4.0	3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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                  (1)             (2)              (3)
for minor              Single-stage         Two-Stage Process
movements, p(x)          Process        Stage I          Stage II
_______________________________________________________________________________
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
_______________________________________________________________________________
Computation 4 and 5
Single-Stage Process
Movement                   1      4      7      8      9     10     11     12
                           L      L      L      T      R      L      T      R
_______________________________________________________________________________
V c,x                     0             116    104    76     108    108    0
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		0		0		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	76	0
Potential Capacity	991	1059
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	991	1059
Probability of Queue free St.	1.00	0.98

Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99

Step 3: TH from Minor St.	8	11
Conflicting Flows	104	108
Potential Capacity	790	786
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	783	779
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	116	108
Potential Capacity	865	876
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	0.99
Maj. L, Min T Adj. Imp Factor.	0.99	0.99
Cap. Adj. factor due to Impeding mvmnt	0.97	0.99
Movement Capacity	839	863

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	104	108
Potential Capacity	790	786
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	783	779

Result for 2 stage process:		
a		
y		
C t	783	779
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10

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

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

Part 3 - Single Stage		
Conflicting Flows	116	108
Potential Capacity	865	876
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	0.99
Maj. L, Min T Adj. Imp Factor.	0.99	0.99
Cap. Adj. factor due to Impeding mvmnt	0.97	0.99
Movement Capacity	839	863

Results for Two-stage process:		
a		
y		
C t	839	863

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	0	4	4	77	7	18
Movement Capacity (vph)	839	783	991	863	779	1059
Shared Lane Capacity (vph)		875			885	

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	839	783	991	863	779	1059
Volume	0	4	4	77	7	18
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		875			885	
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			LTR			LTR	
v (vph)	14			8			102	
C(m) (vph)	1636			875			885	
v/c	0.01			0.01			0.12	
95% queue length	0.03			0.03			0.39	
Control Delay	7.2			9.2			9.6	
LOS	A			A			A	
Approach Delay				9.2			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	73	
v(i2), Volume for stream 3 or 6	7	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

```
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_______________________TWO-WAY STOP CONTROL SUMMARY___________________________

Analyst:                 Vanessa Amado
Agency/Co.:              VAGTEC
Date Performed:          9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection:            2
Jurisdiction:            Culebra
Units: U. S. Customary
Analysis Year:           2015
Project ID:  Culebra Transit Imapct Study Openining year 2015 AM - Int. 2
East/West Street:        PR-250 (Salisberry Street)
North/South Street:      PR-250 (Escudero Street)
Intersection Orientation: NS                 Study period (hrs):  0.25

______________________Vehicle Volumes and Adjustments__________________________
Major Street:  Approach        Northbound              Southbound
               Movement     1      2      3     |  4      5      6
                            L      T      R     |  L      T      R
_______________________________________________________________________________
Volume                      19     68                            67
Peak-Hour Factor, PHF       0.79   0.71                          0.67
Hourly Flow Rate, HFR       24     95                            99
Percent Heavy Vehicles      0      --     --              --     --
Median Type/Storage         Undivided            /
RT Channelized?                                                No
Lanes                          0   1                            1
Configuration                   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
Peak Hour Factor, PHF
Hourly Flow Rate, HFR
Percent Heavy Vehicles
Percent Grade (%)                  0                      0
Flared Approach:  Exists?/Storage               /                     /
Lanes
Configuration
_______________________________________________________________________________

_________________Delay, Queue Length, and Level of Service_________________
Approach             NB     SB         Westbound             Eastbound
Movement             1      4   |  7      8      9    |  10     11     12
Lane Config          LT         |                     |
_______________________________________________________________________________
v (vph)              24
C(m) (vph)           1507
v/c                  0.02
95% queue length     0.05
Control Delay        7.4
LOS                   A
Approach Delay
Approach LOS
_______________________________________________________________________________
```

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 2
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Imapct Study Openining year 2015 AM - Int. 2
East/West Street: PR-250 (Salisberry Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	19	68				67
Peak-Hour Factor, PHF	0.79	0.71				0.67
Peak-15 Minute Volume	6	24				25
Hourly Flow Rate, HFR	24	95				99
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	1				1
Configuration		LT				R
Upstream Signal?		No			No	

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

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:	95	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1							
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0							
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00							
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1							
	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							
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0							
t(f)	2.2							

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	99							
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								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

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

Step 2: LT from Major St.	4	1
Conflicting Flows		99
Potential Capacity		1507
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1507
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.98

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00

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

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

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

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

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	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		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Results for Two-stage process:		
a		
y		
C t		

Worksheet 8-Shared Lane Calculations

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

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
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							
v (vph)	24							
C(m) (vph)	1507							
v/c	0.02							
95% queue length	0.05							
Control Delay	7.4							
LOS	A							
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	95	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
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	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 AM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	18	60	56	32	48	14
Peak-Hour Factor, PHF	0.50	0.67	0.81	1.00	0.73	0.70
Hourly Flow Rate, HFR	36	89	69	32	65	20
Percent Heavy Vehicles	0	--	--	6	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	60	8	56	12	8	35
Peak Hour Factor, PHF	0.78	0.58	0.63	0.75	0.58	0.44
Hourly Flow Rate, HFR	76	13	88	16	13	79
Percent Heavy Vehicles	0	13	0	0	13	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	36	32		177			108	
C(m) (vph)	1550	1398		659			787	
v/c	0.02	0.02		0.27			0.14	
95% queue length	0.07	0.07		1.08			0.47	
Control Delay	7.4	7.6		12.5			10.3	
LOS	A	A		B			B	
Approach Delay				12.5			10.3	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 AM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	18	60	56	32	48	14
Peak-Hour Factor, PHF	0.50	0.67	0.81	1.00	0.73	0.70
Peak-15 Minute Volume	9	22	17	8	16	5
Hourly Flow Rate, HFR	36	89	69	32	65	20
Percent Heavy Vehicles	0	--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	60	8	56	12	8	35
Peak Hour Factor, PHF	0.78	0.58	0.63	0.75	0.58	0.44
Peak-15 Minute Volume	19	3	22	4	3	20
Hourly Flow Rate, HFR	76	13	88	16	13	79
Percent Heavy Vehicles	0	13	0	0	13	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	89	65
Shared ln volume, major rt vehicles:	69	20
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	6	0	13	0	0	13	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	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	4.2	7.1	6.6	6.2	7.1	6.6	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	6	0	13	0	0	13	0
t(f)	2.2	2.3	3.5	4.1	3.3	3.5	4.1	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                    (1)             (2)             (3)
for minor                Single-stage         Two-Stage Process
movements, p(x)            Process        Stage I         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                     65     158    381    325    124    385    369    75
s
Px
V c,u,x
_______________________________________________________________________________
C r,x
C plat,x
_______________________________________________________________________________
Two-Stage Process
                        7               8               10              11
```

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	124	75
Potential Capacity	932	992
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	932	992
Probability of Queue free St.	0.91	0.92

Step 2: LT from Major St.	4	1
Conflicting Flows	158	65
Potential Capacity	1398	1550
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1398	1550
Probability of Queue free St.	0.98	0.98
Maj L-Shared Prob Q free St.	0.98	0.97

Step 3: TH from Minor St.	8	11
Conflicting Flows	325	369
Potential Capacity	575	543
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity	547	516
Probability of Queue free St.	0.98	0.97

Step 4: LT from Minor St.	7	10
Conflicting Flows	381	385
Potential Capacity	581	577
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.93	0.93
Maj. L, Min T Adj. Imp Factor.	0.94	0.95
Cap. Adj. factor due to Impeding mvmnt	0.87	0.86
Movement Capacity	505	494

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	325	369
Potential Capacity	575	543
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity	547	516
Result for 2 stage process:		
a		
y		
C t	547	516
Probability of Queue free St.	0.98	0.97

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	381	385
Potential Capacity	581	577
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.93	0.93
Maj. L, Min T Adj. Imp Factor.	0.94	0.95
Cap. Adj. factor due to Impeding mvmnt	0.87	0.86
Movement Capacity	505	494
Results for Two-stage process:		
a		
y		
C t	505	494

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	76	13	88	16	13	79
Movement Capacity (vph)	505	547	932	494	516	992
Shared Lane Capacity (vph)		659			787	

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	505	547	932	494	516	992
Volume	76	13	88	16	13	79
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		659			787	
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	LTR		LTR			LTR	
v (vph)	36	32		177			108	
C(m) (vph)	1550	1398		659			787	
v/c	0.02	0.02		0.27			0.14	
95% queue length	0.07	0.07		1.08			0.47	
Control Delay	7.4	7.6		12.5			10.3	
LOS	A	A		B			B	
Approach Delay				12.5			10.3	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	0.98
v(il), Volume for stream 2 or 5	89	65
v(i2), Volume for stream 3 or 6	69	20
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.97	0.98
d(M,LT), Delay for stream 1 or 4	7.4	7.6
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.2	0.2

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 AM - Int.4
East/West Street: PR-250
North/South Street: Resaca Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	25	68			91	24
Peak-Hour Factor, PHF	0.60	0.75			0.73	0.60
Hourly Flow Rate, HFR	41	90			124	39
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				3		27
Peak Hour Factor, PHF				0.38		0.61
Hourly Flow Rate, HFR				7		44
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	41						51	
C(m) (vph)	1404						864	
v/c	0.03						0.06	
95% queue length	0.09						0.19	
Control Delay	7.6						9.4	
LOS	A						A	
Approach Delay							9.4	
Approach LOS							A	

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 AM - Int.4
East/West Street: PR-250
North/South Street: Resaca Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	25	68			91	24
Peak-Hour Factor, PHF	0.60	0.75			0.73	0.60
Peak-15 Minute Volume	10	23			31	10
Hourly Flow Rate, HFR	41	90			124	39
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	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				3		27
Peak Hour Factor, PHF				0.38		0.61
Peak-15 Minute Volume				2		11
Hourly Flow Rate, HFR				7		44
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	90	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		4					0		0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1					6.4		6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	4					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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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

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	163					316		144
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		144
Potential Capacity		909
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		909
Probability of Queue free St.	1.00	0.95
Step 2: LT from Major St.	4	1
Conflicting Flows		163
Potential Capacity		1404
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1404
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		316
Potential Capacity		681
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	0.93	0.97
Movement Capacity		661

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		316
Potential Capacity		681
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	0.93	0.97
Movement Capacity		661
Results for Two-stage process:		
a		
y		
C t		661

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				7		44
Movement Capacity (vph)				661		909
Shared Lane Capacity (vph)					864	

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				661		909
Volume				7		44
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					864	
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)	41						51	
C(m) (vph)	1404						864	
v/c	0.03						0.06	
95% queue length	0.09						0.19	
Control Delay	7.6						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)	0.97	1.00
v(il), Volume for stream 2 or 5	90	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
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	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year AM - Int 5
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	0	5	51	26	4
Peak-Hour Factor, PHF	0.90	0.90	0.63	0.81	0.50	0.50
Hourly Flow Rate, HFR	0	0	7	62	52	8
Percent Heavy Vehicles	0	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	4	4	25	4	4	0
Peak Hour Factor, PHF	0.33	0.50	0.69	0.33	0.50	0.90
Hourly Flow Rate, HFR	12	8	36	12	8	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	62		56			20	
C(m) (vph)	1556	1614		918			694	
v/c	0.00	0.04		0.06			0.03	
95% queue length	0.00	0.12		0.19			0.09	
Control Delay	7.3	7.3		9.2			10.3	
LOS	A	A		A			B	
Approach Delay				9.2			10.3	
Approach LOS				A			B	

HCS+: Unsignalized Intersections Release 5.6

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

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year AM - Int 5
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	0	0	5	51	26	4
Peak-Hour Factor, PHF	0.90	0.90	0.63	0.81	0.50	0.50
Peak-15 Minute Volume	0	0	2	16	13	2
Hourly Flow Rate, HFR	0	0	7	62	52	8
Percent Heavy Vehicles	0	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	4	4	25	4	4	0
Peak Hour Factor, PHF	0.33	0.50	0.69	0.33	0.50	0.90
Peak-15 Minute Volume	3	2	9	3	2	0
Hourly Flow Rate, HFR	12	8	36	12	8	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	52
Shared ln volume, major rt vehicles:	7	8
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	2	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	2	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

Computation 3-Platoon Event Periods

	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	60	7	188	188	4	206	187	56
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	4	56
Potential Capacity	1085	1016
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1085	1016
Probability of Queue free St.	0.97	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	7	60
Potential Capacity	1614	1556
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1614	1556
Probability of Queue free St.	0.96	1.00
Maj L-Shared Prob Q free St.	0.96	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	188	187
Potential Capacity	710	711
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity	682	683
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	188	206
Potential Capacity	777	756
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.95	0.95
Maj. L, Min T Adj. Imp Factor.	0.96	0.96
Cap. Adj. factor due to Impeding mvmnt	0.96	0.93
Movement Capacity	747	702

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	188	187
Potential Capacity	710	711
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity	682	683
Result for 2 stage process:		
a		
y		
C t	682	683
Probability of Queue free St.	0.99	0.99

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	188	206
Potential Capacity	777	756
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.95	0.95
Maj. L, Min T Adj. Imp Factor.	0.96	0.96
Cap. Adj. factor due to Impeding mvmnt	0.96	0.93
Movement Capacity	747	702
Results for Two-stage process:		
a		
y		
C t	747	702

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	12	8	36	12	8	0
Movement Capacity (vph)	747	682	1085	702	683	1016
Shared Lane Capacity (vph)		918			694	

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	747	682	1085	702	683	1016
Volume	12	8	36	12	8	0
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		918			694	
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	LTR		LTR			LTR	
v (vph)	0	62		56			20	
C(m) (vph)	1556	1614		918			694	
v/c	0.00	0.04		0.06			0.03	
95% queue length	0.00	0.12		0.19			0.09	
Control Delay	7.3	7.3		9.2			10.3	
LOS	A	A		A			B	
Approach Delay				9.2			10.3	
Approach LOS				A			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.96
v(il), Volume for stream 2 or 5	0	52
v(i2), Volume for stream 3 or 6	7	8
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.96
d(M,LT), Delay for stream 1 or 4	7.3	7.3
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.3

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 AM - Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	16	74	9	24	0
Peak-Hour Factor, PHF	0.25	0.80	0.58	0.25	0.55	0.90
Hourly Flow Rate, HFR	4	19	127	36	43	0
Percent Heavy Vehicles	0	--	--	11	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	56	0	1	1	1	1
Peak Hour Factor, PHF	0.50	0.90	0.25	0.25	0.25	0.25
Hourly Flow Rate, HFR	112	0	4	4	4	4
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	4	36		116			12	
C(m) (vph)	1579	1383		737			762	
v/c	0.00	0.03		0.16			0.02	
95% queue length	0.01	0.08		0.56			0.05	
Control Delay	7.3	7.7		10.8			9.8	
LOS	A	A		B			A	
Approach Delay				10.8			9.8	
Approach LOS				B			A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 AM - Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	1	16	74	9	24	0
Peak-Hour Factor, PHF	0.25	0.80	0.58	0.25	0.55	0.90
Peak-15 Minute Volume	1	5	32	9	11	0
Hourly Flow Rate, HFR	4	19	127	36	43	0
Percent Heavy Vehicles	0	--	--	11	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	56	0	1	1	1	1
Peak Hour Factor, PHF	0.50	0.90	0.25	0.25	0.25	0.25
Peak-15 Minute Volume	28	0	1	1	1	1
Hourly Flow Rate, HFR	112	0	4	4	4	4
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	19	43
Shared ln volume, major rt vehicles:	127	0
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	11	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	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	4.2	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	11	0	0	0	0	0	0
t(f)	2.2	2.3	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods

	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	43	146	209	205	82	207	269	43
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	82	43
Potential Capacity	983	1033
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	983	1033
Probability of Queue free St.	1.00	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	146	43
Potential Capacity	1383	1579
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1383	1579
Probability of Queue free St.	0.97	1.00
Maj L-Shared Prob Q free St.	0.97	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	205	269
Potential Capacity	695	641
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity	675	622
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	209	207
Potential Capacity	753	755
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.96	0.97
Maj. L, Min T Adj. Imp Factor.	0.97	0.98
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity	730	735

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	205	269
Potential Capacity	695	641
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity	675	622
Result for 2 stage process:		
a		
y		
C t	675	622
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	209	207
Potential Capacity	753	755
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.96	0.97
Maj. L, Min T Adj. Imp Factor.	0.97	0.98
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity	730	735
Results for Two-stage process:		
a		
y		
C t	730	735

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	112	0	4	4	4	4
Movement Capacity (vph)	730	675	983	735	622	1033
Shared Lane Capacity (vph)		737			762	

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	730	675	983	735	622	1033
Volume	112	0	4	4	4	4
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		737			762	
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	LTR		LTR			LTR	
v (vph)	4	36		116			12	
C(m) (vph)	1579	1383		737			762	
v/c	0.00	0.03		0.16			0.02	
95% queue length	0.01	0.08		0.56			0.05	
Control Delay	7.3	7.7		10.8			9.8	
LOS	A	A		B			A	
Approach Delay				10.8			9.8	
Approach LOS				B			A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.97
v(il), Volume for stream 2 or 5	19	43
v(i2), Volume for stream 3 or 6	127	0
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.97
d(M,LT), Delay for stream 1 or 4	7.3	7.7
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.2

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TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM - Int. 1
East/West Street: PR-250 (Pedro Márquez Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	4	82	2			
Peak-Hour Factor, PHF	0.75	0.75	0.50			
Hourly Flow Rate, HFR	5	109	4			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	3	63	1	10
Peak Hour Factor, PHF	0.90	0.90	0.38	0.74	0.25	0.83
Hourly Flow Rate, HFR	0	0	7	85	4	12
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR			LTR			LTR	
v (vph)	5			7			101	
C(m) (vph)	1636			948			866	
v/c	0.00			0.01			0.12	
95% queue length	0.01			0.02			0.39	
Control Delay	7.2			8.8			9.7	
LOS	A			A			A	
Approach Delay				8.8			9.7	
Approach LOS				A			A	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM - Int. 1
East/West Street: PR-250 (Pedro Márquez Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	4	82	2			
Peak-Hour Factor, PHF	0.75	0.75	0.50			
Peak-15 Minute Volume	1	27	1			
Hourly Flow Rate, HFR	5	109	4			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	3	63	1	10
Peak Hour Factor, PHF	0.90	0.90	0.38	0.74	0.25	0.83
Peak-15 Minute Volume	0	0	2	21	1	3
Hourly Flow Rate, HFR	0	0	7	85	4	12
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	109	
Shared ln volume, major rt vehicles:	4	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1		7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0		0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00		0.00	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		7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20		3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0		0	0	0	0	0	0
t(f)	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

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

Computation 2-Proportion of TWSC Intersection Time blocked

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	0		129	121	111	124	123	0
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		0		0		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	111	0
Potential Capacity	948	1091
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	948	1091
Probability of Queue free St.	0.99	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	121	123
Potential Capacity	773	771
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	770	768
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	129	124
Potential Capacity	849	855
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	1.00
Maj. L, Min T Adj. Imp Factor.	0.99	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.99
Movement Capacity	834	847

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	121	123
Potential Capacity	773	771
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity	770	768

Result for 2 stage process:		
a		
y		
C t	770	768
Probability of Queue free St.	1.00	0.99

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

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

Part 3 - Single Stage		
Conflicting Flows	129	124
Potential Capacity	849	855
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	1.00
Maj. L, Min T Adj. Imp Factor.	0.99	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.99
Movement Capacity	834	847

Results for Two-stage process:		
a		
y		
C t	834	847

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	0	0	7	85	4	12
Movement Capacity (vph)	834	770	948	847	768	1091
Shared Lane Capacity (vph)		948			866	

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	834	770	948	847	768	1091
Volume	0	0	7	85	4	12
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		948			866	
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			LTR			LTR	
v (vph)	5			7			101	
C(m) (vph)	1636			948			866	
v/c	0.00			0.01			0.12	
95% queue length	0.01			0.02			0.39	
Control Delay	7.2			8.8			9.7	
LOS	A			A			A	
Approach Delay				8.8			9.7	
Approach LOS				A			A	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	109	
v(i2), Volume for stream 3 or 6	4	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	1.00	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.0	

```
                   HCS+: Unsignalized Intersections Release 5.6

_______________________TWO-WAY STOP CONTROL SUMMARY___________________________

Analyst:              Vanessa Amado
Agency/Co.:           VAGTEC
Date Performed:       9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection:         2
Jurisdiction:         Culebra
Units: U. S. Customary
Analysis Year:        2015
Project ID:  Culebra Transit Impact Study Opening year 2015 PM - Int. 2
East/West Street:     PR-250 (Salisberry Street)
North/South Street:   PR-250 (Escudero Street)
Intersection Orientation: NS                Study period (hrs):  0.25

______________________Vehicle Volumes and Adjustments_________________________
Major Street:  Approach        Northbound              Southbound
               Movement     1      2      3     |  4      5      6
                            L      T      R     |  L      T      R
______________________________________________________________________________
Volume                      13     109                           88
Peak-Hour Factor, PHF       0.46   0.86                          0.87
Hourly Flow Rate, HFR       28     126                           101
Percent Heavy Vehicles      0      --     --                --     --
Median Type/Storage         Undivided            /
RT Channelized?                                                No
Lanes                          0   1                            1
Configuration                   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
Peak Hour Factor, PHF
Hourly Flow Rate, HFR
Percent Heavy Vehicles
Percent Grade (%)                  0                      0
Flared Approach:  Exists?/Storage                 /                      /
Lanes
Configuration
______________________________________________________________________________

__________________Delay, Queue Length, and Level of Service___________________
Approach             NB     SB        Westbound              Eastbound
Movement             1      4   |  7      8      9     |  10     11     12
Lane Config          LT         |                      |
______________________________________________________________________________
v (vph)              28
C(m) (vph)           1504
v/c                  0.02
95% queue length     0.06
Control Delay        7.4
LOS                   A
Approach Delay
Approach LOS
______________________________________________________________________________
```

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 2
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM - Int. 2
East/West Street: PR-250 (Salisberry Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	13	109				88
Peak-Hour Factor, PHF	0.46	0.86				0.87
Peak-15 Minute Volume	7	32				25
Hourly Flow Rate, HFR	28	126				101
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	1			1	
Configuration	LT				R	
Upstream Signal?		No			No	

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

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:	126	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1							
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0							
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00							
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1							
	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							
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0							
t(f)	2.2							

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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                    (1)             (2)             (3)
for minor                Single-stage        Two-Stage Process
movements, p(x)            Process       Stage I         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                      101
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								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

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

Step 2: LT from Major St.	4	1
Conflicting Flows		101
Potential Capacity		1504
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1504
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		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		

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

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

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

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

Results for Two-stage process:
a
y
C t

Worksheet 8-Shared Lane Calculations

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

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
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							
v (vph)	28							
C(m) (vph)	1504							
v/c	0.02							
95% queue length	0.06							
Control Delay	7.4							
LOS	A							
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	126	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
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	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	43	71	83	43	63	16
Peak-Hour Factor, PHF	0.70	0.67	0.81	0.79	0.78	0.57
Hourly Flow Rate, HFR	61	105	102	54	80	28
Percent Heavy Vehicles	0	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	66	15	64	12	15	26
Peak Hour Factor, PHF	0.90	0.63	0.77	0.75	0.63	0.81
Hourly Flow Rate, HFR	73	23	83	16	23	32
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	61	54		179			71	
C(m) (vph)	1495	1364		556			542	
v/c	0.04	0.04		0.32			0.13	
95% queue length	0.13	0.12		1.38			0.45	
Control Delay	7.5	7.7		14.5			12.6	
LOS	A	A		B			B	
Approach Delay				14.5			12.6	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	43	71	83	43	63	16
Peak-Hour Factor, PHF	0.70	0.67	0.81	0.79	0.78	0.57
Peak-15 Minute Volume	15	26	26	14	20	7
Hourly Flow Rate, HFR	61	105	102	54	80	28
Percent Heavy Vehicles	0	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	66	15	64	12	15	26
Peak Hour Factor, PHF	0.90	0.63	0.77	0.75	0.63	0.81
Peak-15 Minute Volume	18	6	21	4	6	8
Hourly Flow Rate, HFR	73	23	83	16	23	32
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	105	80
Shared ln volume, major rt vehicles:	102	28
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	2	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	2	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                    (1)             (2)              (3)
for minor                Single-stage         Two-Stage Process
movements, p(x)            Process        Stage I         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                    108    207    508    494    156    533    531    94
s
Px
V c,u,x
________________________________________________________________________________
C r,x
C plat,x
________________________________________________________________________________
Two-Stage Process
                        7                8               10               11
```

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	156	94
Potential Capacity	895	968
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	895	968
Probability of Queue free St.	0.91	0.97

Step 2: LT from Major St.	4	1
Conflicting Flows	207	108
Potential Capacity	1364	1495
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1364	1495
Probability of Queue free St.	0.96	0.96
Maj L-Shared Prob Q free St.	0.96	0.95

Step 3: TH from Minor St.	8	11
Conflicting Flows	494	531
Potential Capacity	479	457
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.91	0.91
Movement Capacity	437	417
Probability of Queue free St.	0.95	0.94

Step 4: LT from Minor St.	7	10
Conflicting Flows	508	533
Potential Capacity	479	461
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.86	0.87
Maj. L, Min T Adj. Imp Factor.	0.89	0.90
Cap. Adj. factor due to Impeding mvmnt	0.87	0.81
Movement Capacity	414	375

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	494	531
Potential Capacity	479	457
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.91	0.91
Movement Capacity	437	417
Result for 2 stage process:		
a		
y		
C t	437	417
Probability of Queue free St.	0.95	0.94

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	508	533
Potential Capacity	479	461
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.86	0.87
Maj. L, Min T Adj. Imp Factor.	0.89	0.90
Cap. Adj. factor due to Impeding mvmnt	0.87	0.81
Movement Capacity	414	375
Results for Two-stage process:		
a		
y		
C t	414	375

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	73	23	83	16	23	32
Movement Capacity (vph)	414	437	895	375	417	968
Shared Lane Capacity (vph)		556			542	

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	414	437	895	375	417	968
Volume	73	23	83	16	23	32
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		556			542	
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	LTR		LTR			LTR	
v (vph)	61	54		179			71	
C(m) (vph)	1495	1364		556			542	
v/c	0.04	0.04		0.32			0.13	
95% queue length	0.13	0.12		1.38			0.45	
Control Delay	7.5	7.7		14.5			12.6	
LOS	A	A		B			B	
Approach Delay				14.5			12.6	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.96	0.96
v(il), Volume for stream 2 or 5	105	80
v(i2), Volume for stream 3 or 6	102	28
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.95	0.96
d(M,LT), Delay for stream 1 or 4	7.5	7.7
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.3	0.3

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM- Int. 4
East/West Street: PR-250
North/South Street: Resaca Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	48	87			91	29
Peak-Hour Factor, PHF	0.67	0.81			0.63	0.60
Hourly Flow Rate, HFR	71	107			144	48
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT				TR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				9		42
Peak Hour Factor, PHF				0.33		0.85
Hourly Flow Rate, HFR				27		49
Percent Heavy Vehicles				11		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	71						76	
C(m) (vph)	1394						723	
v/c	0.05						0.11	
95% queue length	0.16						0.35	
Control Delay	7.7						10.6	
LOS	A						B	
Approach Delay							10.6	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM- Int. 4
East/West Street: PR-250
North/South Street: Resaca Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	48	87			91	29
Peak-Hour Factor, PHF	0.67	0.81			0.63	0.60
Peak-15 Minute Volume	18	27			36	12
Hourly Flow Rate, HFR	71	107			144	48
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT				TR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				9		42
Peak Hour Factor, PHF				0.33		0.85
Peak-15 Minute Volume				7		12
Hourly Flow Rate, HFR				27		49
Percent Heavy Vehicles				11		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	107	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0					11		0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1					6.5		6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					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					11		0
t(f)	2.2					3.6		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

Computation 2-Proportion of TWSC Intersection Time blocked

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	192					417		168
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		168
Potential Capacity		881
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		881
Probability of Queue free St.	1.00	0.94

Step 2: LT from Major St.	4	1
Conflicting Flows		192
Potential Capacity		1394
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1394
Probability of Queue free St.	1.00	0.95
Maj L-Shared Prob Q free St.		0.95

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	0.95	0.95
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		417
Potential Capacity		575
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.95	
Maj. L, Min T Adj. Imp Factor.	0.96	
Cap. Adj. factor due to Impeding mvmnt	0.91	0.95
Movement Capacity		546

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	0.95	0.95
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		417
Potential Capacity		575
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.95	
Maj. L, Min T Adj. Imp Factor.	0.96	
Cap. Adj. factor due to Impeding mvmnt	0.91	0.95
Movement Capacity		546
Results for Two-stage process:		
a		
y		
C t		546

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				27		49
Movement Capacity (vph)				546		881
Shared Lane Capacity (vph)					723	

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				546		881
Volume				27		49
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					723	
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)	71						76	
C(m) (vph)	1394						723	
v/c	0.05						0.11	
95% queue length	0.16						0.35	
Control Delay	7.7						10.6	
LOS	A						B	
Approach Delay							10.6	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.95	1.00
v(il), Volume for stream 2 or 5	107	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.95	
d(M,LT), Delay for stream 1 or 4	7.7	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.4	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM - Int.5
East/West Street: Local Rd./ PR-250 WB
North/South Street: PR-250 SB/ Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	1	1	4	54	36	0
Peak-Hour Factor, PHF	0.25	0.25	0.50	0.68	0.25	0.90
Hourly Flow Rate, HFR	4	4	8	79	144	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	12	6	21	0	7	0
Peak Hour Factor, PHF	0.75	0.75	0.50	0.90	0.44	0.90
Hourly Flow Rate, HFR	16	8	42	0	15	0
Percent Heavy Vehicles	0	0	5	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	4	79		66			15	
C(m) (vph)	1451	1620		819			566	
v/c	0.00	0.05		0.08			0.03	
95% queue length	0.01	0.15		0.26			0.08	
Control Delay	7.5	7.3		9.8			11.5	
LOS	A	A		A			B	
Approach Delay				9.8			11.5	
Approach LOS				A			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM - Int.5
East/West Street: Local Rd./ PR-250 WB
North/South Street: PR-250 SB/ Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	1	1	4	54	36	0
Peak-Hour Factor, PHF	0.25	0.25	0.50	0.68	0.25	0.90
Peak-15 Minute Volume	1	1	2	20	36	0
Hourly Flow Rate, HFR	4	4	8	79	144	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	12	6	21	0	7	0
Peak Hour Factor, PHF	0.75	0.75	0.50	0.90	0.44	0.90
Peak-15 Minute Volume	4	2	10	0	4	0
Hourly Flow Rate, HFR	16	8	42	0	15	0
Percent Heavy Vehicles	0	0	5	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	4	144
Shared ln volume, major rt vehicles:	8	0
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	5	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.3	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	5	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	144	12	326	318	8	343	322	144
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	8	144
Potential Capacity	1065	909
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1065	909
Probability of Queue free St.	0.96	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	12	144
Potential Capacity	1620	1451
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1620	1451
Probability of Queue free St.	0.95	1.00
Maj L-Shared Prob Q free St.	0.95	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	318	322
Potential Capacity	602	599
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	568	566
Probability of Queue free St.	0.99	0.97

Step 4: LT from Minor St.	7	10
Conflicting Flows	326	343
Potential Capacity	631	615
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.92	0.93
Maj. L, Min T Adj. Imp Factor.	0.94	0.95
Cap. Adj. factor due to Impeding mvmnt	0.94	0.91
Movement Capacity	592	559

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	318	322
Potential Capacity	602	599
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	568	566

Result for 2 stage process:		
a		
y		
C t	568	566
Probability of Queue free St.	0.99	0.97

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	326	343
Potential Capacity	631	615
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.92	0.93
Maj. L, Min T Adj. Imp Factor.	0.94	0.95
Cap. Adj. factor due to Impeding mvmnt	0.94	0.91
Movement Capacity	592	559

Results for Two-stage process:		
a		
y		
C t	592	559

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	16	8	42	0	15	0
Movement Capacity (vph)	592	568	1065	559	566	909
Shared Lane Capacity (vph)		819			566	

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	592	568	1065	559	566	909
Volume	16	8	42	0	15	0
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		819			566	
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	LTR		LTR			LTR	
v (vph)	4	79		66			15	
C(m) (vph)	1451	1620		819			566	
v/c	0.00	0.05		0.08			0.03	
95% queue length	0.01	0.15		0.26			0.08	
Control Delay	7.5	7.3		9.8			11.5	
LOS	A	A		A			B	
Approach Delay				9.8			11.5	
Approach LOS				A			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.95
v(il), Volume for stream 2 or 5	4	144
v(i2), Volume for stream 3 or 6	8	0
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.95
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	0.0	0.4

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	14	102	63	15	0
Peak-Hour Factor, PHF	0.25	0.70	0.44	0.90	0.75	0.90
Hourly Flow Rate, HFR	4	20	231	70	20	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	71	0	2	0	1	0
Peak Hour Factor, PHF	0.58	0.90	0.25	0.90	0.25	0.90
Hourly Flow Rate, HFR	122	0	8	0	4	0
Percent Heavy Vehicles	1	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	4	70		130			4	
C(m) (vph)	1609	1326		629			498	
v/c	0.00	0.05		0.21			0.01	
95% queue length	0.01	0.17		0.77			0.02	
Control Delay	7.2	7.9		12.2			12.3	
LOS	A	A		B			B	
Approach Delay				12.2			12.3	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Opening year 2015 PM Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	1	14	102	63	15	0
Peak-Hour Factor, PHF	0.25	0.70	0.44	0.90	0.75	0.90
Peak-15 Minute Volume	1	5	58	18	5	0
Hourly Flow Rate, HFR	4	20	231	70	20	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	71	0	2	0	1	0
Peak Hour Factor, PHF	0.58	0.90	0.25	0.90	0.25	0.90
Peak-15 Minute Volume	31	0	2	0	1	0
Hourly Flow Rate, HFR	122	0	8	0	4	0
Percent Heavy Vehicles	1	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	20	20
Shared ln volume, major rt vehicles:	231	0
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	1	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	1	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p		0.000		0.000

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	20	251	306	304	136	308	419	20
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	136	20
Potential Capacity	918	1064
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	918	1064
Probability of Queue free St.	0.99	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	251	20
Potential Capacity	1326	1609
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1326	1609
Probability of Queue free St.	0.95	1.00
Maj L-Shared Prob Q free St.	0.95	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	304	419
Potential Capacity	613	528
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	579	498
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	306	308
Potential Capacity	648	648
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.94	0.94
Maj. L, Min T Adj. Imp Factor.	0.95	0.96
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity	616	615

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	304	419
Potential Capacity	613	528
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	579	498
Result for 2 stage process:		
a		
y		
C t	579	498
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	306	308
Potential Capacity	648	648
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.94	0.94
Maj. L, Min T Adj. Imp Factor.	0.95	0.96
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity	616	615
Results for Two-stage process:		
a		
y		
C t	616	615

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	122	0	8	0	4	0
Movement Capacity (vph)	616	579	918	615	498	1064
Shared Lane Capacity (vph)		629			498	

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	616	579	918	615	498	1064
Volume	122	0	8	0	4	0
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		629			498	
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	LTR		LTR			LTR	
v (vph)	4	70		130			4	
C(m) (vph)	1609	1326		629			498	
v/c	0.00	0.05		0.21			0.01	
95% queue length	0.01	0.17		0.77			0.02	
Control Delay	7.2	7.9		12.2			12.3	
LOS	A	A		B			B	
Approach Delay				12.2			12.3	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.95
v(il), Volume for stream 2 or 5	20	20
v(i2), Volume for stream 3 or 6	231	0
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.95
d(M,LT), Delay for stream 1 or 4	7.2	7.9
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.4

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TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Imapct Study Weekend 2015 AM - Int. 1
East/West Street: PR-250 (Pedro Márquez Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	14	102	6			
Peak-Hour Factor, PHF	0.50	0.69	0.38			
Hourly Flow Rate, HFR	28	147	15			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0			
Configuration	LTR					
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	96	10	18
Peak Hour Factor, PHF	0.90	0.25	0.25	0.62	0.63	0.50
Hourly Flow Rate, HFR	0	8	4	154	15	36
Percent Heavy Vehicles	0	0	0	0	0	11
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR			LTR			LTR	
v (vph)	28			12			205	
C(m) (vph)	1636			738			762	
v/c	0.02			0.02			0.27	
95% queue length	0.05			0.05			1.09	
Control Delay	7.2			10.0-			11.5	
LOS	A			A			B	
Approach Delay				10.0-			11.5	
Approach LOS				A			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Imapct Study Weekend 2015 AM - Int. 1
East/West Street: PR-250 (Pedro Márquez Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	14	102	6			
Peak-Hour Factor, PHF	0.50	0.69	0.38			
Peak-15 Minute Volume	7	37	4			
Hourly Flow Rate, HFR	28	147	15			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	2	1	96	10	18
Peak Hour Factor, PHF	0.90	0.25	0.25	0.62	0.63	0.50
Peak-15 Minute Volume	0	2	1	39	4	9
Hourly Flow Rate, HFR	0	8	4	154	15	36
Percent Heavy Vehicles	0	0	0	0	0	11
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	147	
Shared ln volume, major rt vehicles:	15	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1		7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0		0	0	0	0	0	11
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00		0.00	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		7.1	6.5	6.2	7.1	6.5	6.3
	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	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0		0	0	0	0	0	11
t(f)	2.2		3.5	4.0	3.3	3.5	4.0	3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

Computation 2-Proportion of TWSC Intersection Time blocked

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	0		236	210	154	216	218	0
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		0		0		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	154	0
Potential Capacity	897	1059
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	897	1059
Probability of Queue free St.	1.00	0.97

Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.98

Step 3: TH from Minor St.	8	11
Conflicting Flows	210	218
Potential Capacity	691	684
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	678	671
Probability of Queue free St.	0.99	0.98

Step 4: LT from Minor St.	7	10
Conflicting Flows	236	216
Potential Capacity	723	745
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.96	0.97
Maj. L, Min T Adj. Imp Factor.	0.97	0.98
Cap. Adj. factor due to Impeding mvmnt	0.94	0.97
Movement Capacity	677	724

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	210	218
Potential Capacity	691	684
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	678	671

Result for 2 stage process:		
a		
y		
C t	678	671
Probability of Queue free St.	0.99	0.98

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	236	216
Potential Capacity	723	745
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.96	0.97
Maj. L, Min T Adj. Imp Factor.	0.97	0.98
Cap. Adj. factor due to Impeding mvmnt	0.94	0.97
Movement Capacity	677	724

Results for Two-stage process:		
a		
y		
C t	677	724

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	0	8	4	154	15	36
Movement Capacity (vph)	677	678	897	724	671	1059
Shared Lane Capacity (vph)		738			762	

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	677	678	897	724	671	1059
Volume	0	8	4	154	15	36
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		738			762	
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			LTR			LTR	
v (vph)	28			12			205	
C(m) (vph)	1636			738			762	
v/c	0.02			0.02			0.27	
95% queue length	0.05			0.05			1.09	
Control Delay	7.2			10.0-			11.5	
LOS	A			A			B	
Approach Delay				10.0-			11.5	
Approach LOS				A			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	147	
v(i2), Volume for stream 3 or 6	15	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 2
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Imapct Study Weekend 2015 AM - Int. 2
East/West Street: PR-250 (Salisberry Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	38	136				134
Peak-Hour Factor, PHF	0.79	0.71				0.67
Hourly Flow Rate, HFR	48	191				199
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	1				1
Configuration	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						
Peak Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes						
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT							
v (vph)	48							
C(m) (vph)	1385							
v/c	0.03							
95% queue length	0.11							
Control Delay	7.7							
LOS	A							
Approach Delay								
Approach LOS								

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 2
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Imapct Study Weekend 2015 AM - Int. 2
East/West Street: PR-250 (Salisberry Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	38	136				134
Peak-Hour Factor, PHF	0.79	0.71				0.67
Peak-15 Minute Volume	12	48				50
Hourly Flow Rate, HFR	48	191				199
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	1				1
Configuration	LT					R
Upstream Signal?		No			No	

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

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:	191	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1							
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0							
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00							
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1							
	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							
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0							
t(f)	2.2							

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	199							
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								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

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

Step 2: LT from Major St.					4		1	
Conflicting Flows							199	
Potential Capacity							1385	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							1385	
Probability of Queue free St.					1.00		0.97	
Maj L-Shared Prob Q free St.							0.96	

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					0.96		0.96	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	

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

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

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

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

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity		

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

Step 4: LT from Minor St.	7	10

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

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

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		

Results for Two-stage process:
a
y
C t

Worksheet 8-Shared Lane Calculations

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

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
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							
v (vph)	48							
C(m) (vph)	1385							
v/c	0.03							
95% queue length	0.11							
Control Delay	7.7							
LOS	A							
Approach Delay								
Approach LOS								

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	191	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.96	
d(M,LT), Delay for stream 1 or 4	7.7	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.3	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 AM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	36	120	112	72	96	28
Peak-Hour Factor, PHF	0.50	0.67	0.81	1.00	0.73	0.70
Hourly Flow Rate, HFR	72	179	138	72	131	40
Percent Heavy Vehicles	0	--	--	6	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	120	16	112	24	16	70
Peak Hour Factor, PHF	0.78	0.58	0.63	0.75	0.58	0.44
Hourly Flow Rate, HFR	153	27	177	32	27	159
Percent Heavy Vehicles	0	13	0	0	13	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	72	72		357			218	
C(m) (vph)	1467	1221		354			510	
v/c	0.05	0.06		1.01			0.43	
95% queue length	0.15	0.19		11.76			2.12	
Control Delay	7.6	8.1		85.0			17.2	
LOS	A	A		F			C	
Approach Delay				85.0			17.2	
Approach LOS				F			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 AM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	36	120	112	72	96	28
Peak-Hour Factor, PHF	0.50	0.67	0.81	1.00	0.73	0.70
Peak-15 Minute Volume	18	45	35	18	33	10
Hourly Flow Rate, HFR	72	179	138	72	131	40
Percent Heavy Vehicles	0	--	--	6	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	120	16	112	24	16	70
Peak Hour Factor, PHF	0.78	0.58	0.63	0.75	0.58	0.44
Peak-15 Minute Volume	38	7	44	8	7	40
Hourly Flow Rate, HFR	153	27	177	32	27	159
Percent Heavy Vehicles	0	13	0	0	13	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	179	131
Shared ln volume, major rt vehicles:	138	40
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	6	0	13	0	0	13	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	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	4.2	7.1	6.6	6.2	7.1	6.6	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	6	0	13	0	0	13	0
t(f)	2.2	2.3	3.5	4.1	3.3	3.5	4.1	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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	131	317	780	667	248	789	756	151
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	248	151
Potential Capacity	796	901
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	796	901
Probability of Queue free St.	0.78	0.82

Step 2: LT from Major St.	4	1
Conflicting Flows	317	131
Potential Capacity	1221	1467
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1221	1467
Probability of Queue free St.	0.94	0.95
Maj L-Shared Prob Q free St.	0.93	0.94

Step 3: TH from Minor St.	8	11
Conflicting Flows	667	756
Potential Capacity	366	325
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.88	0.88
Movement Capacity	321	285
Probability of Queue free St.	0.92	0.91

Step 4: LT from Minor St.	7	10
Conflicting Flows	780	789
Potential Capacity	315	311
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.79	0.80
Maj. L, Min T Adj. Imp Factor.	0.84	0.85
Cap. Adj. factor due to Impeding mvmnt	0.69	0.66
Movement Capacity	218	205

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	667	756
Potential Capacity	366	325
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.88	0.88
Movement Capacity	321	285
Result for 2 stage process:		
a		
y		
C t	321	285
Probability of Queue free St.	0.92	0.91

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	780	789
Potential Capacity	315	311
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.79	0.80
Maj. L, Min T Adj. Imp Factor.	0.84	0.85
Cap. Adj. factor due to Impeding mvmnt	0.69	0.66
Movement Capacity	218	205
Results for Two-stage process:		
a		
y		
C t	218	205

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	153	27	177	32	27	159
Movement Capacity (vph)	218	321	796	205	285	901
Shared Lane Capacity (vph)		354			510	

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	218	321	796	205	285	901
Volume	153	27	177	32	27	159
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		354			510	
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	LTR		LTR			LTR	
v (vph)	72	72		357			218	
C(m) (vph)	1467	1221		354			510	
v/c	0.05	0.06		1.01			0.43	
95% queue length	0.15	0.19		11.76			2.12	
Control Delay	7.6	8.1		85.0			17.2	
LOS	A	A		F			C	
Approach Delay				85.0			17.2	
Approach LOS				F			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.95	0.94
v(il), Volume for stream 2 or 5	179	131
v(i2), Volume for stream 3 or 6	138	40
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.94	0.93
d(M,LT), Delay for stream 1 or 4	7.6	8.1
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.5	0.5

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 AM - Int.4
East/West Street: PR-250
North/South Street: Resaca Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	50	136			182	48
Peak-Hour Factor, PHF	0.60	0.75			0.73	0.60
Hourly Flow Rate, HFR	83	181			249	79
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				6		54
Peak Hour Factor, PHF				0.38		0.61
Hourly Flow Rate, HFR				15		88
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	83						103	
C(m) (vph)	1220						676	
v/c	0.07						0.15	
95% queue length	0.22						0.54	
Control Delay	8.2						11.3	
LOS	A						B	
Approach Delay							11.3	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 AM - Int.4
East/West Street: PR-250
North/South Street: Resaca Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	50	136			182	48
Peak-Hour Factor, PHF	0.60	0.75			0.73	0.60
Peak-15 Minute Volume	21	45			62	20
Hourly Flow Rate, HFR	83	181			249	79
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	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				6		54
Peak Hour Factor, PHF				0.38		0.61
Peak-15 Minute Volume				4		22
Hourly Flow Rate, HFR				15		88
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	181	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		4					0		0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1					6.4		6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	4					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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

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

Computation 2-Proportion of TWSC Intersection Time blocked

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	328					635		288
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		288
Potential Capacity		756
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		756
Probability of Queue free St.	1.00	0.88

Step 2: LT from Major St.	4	1
Conflicting Flows		328
Potential Capacity		1220
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1220
Probability of Queue free St.	1.00	0.93
Maj L-Shared Prob Q free St.		0.92

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	0.92	0.92
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		635
Potential Capacity		446
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.92	
Maj. L, Min T Adj. Imp Factor.	0.94	
Cap. Adj. factor due to Impeding mvmnt	0.83	0.93
Movement Capacity		416

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           0.92            0.92
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                                                635
Potential Capacity                                               446
Pedestrian Impedance Factor                      1.00            1.00
Maj. L, Min T Impedance factor                   0.92
Maj. L, Min T Adj. Imp Factor.                   0.94
Cap. Adj. factor due to Impeding mvmnt           0.83            0.93
Movement Capacity                                                416
______________________________________________________________________________
Results for Two-stage process:
a
y
C t                                                              416
______________________________________________________________________________

Worksheet 8-Shared Lane Calculations
______________________________________________________________________________
Movement                              7      8      9     10     11     12
                                      L      T      R      L      T      R

______________________________________________________________________________
Volume (vph)                                              15            88
Movement Capacity (vph)                                   416           756
Shared Lane Capacity (vph)                                       676
______________________________________________________________________________
```

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				416		756
Volume				15		88
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					676	
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)	83						103	
C(m) (vph)	1220						676	
v/c	0.07						0.15	
95% queue length	0.22						0.54	
Control Delay	8.2						11.3	
LOS	A						B	
Approach Delay							11.3	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.93	1.00
v(il), Volume for stream 2 or 5	181	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.92	
d(M,LT), Delay for stream 1 or 4	8.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.6	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend AM - Int 5
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	0	10	102	52	8
Peak-Hour Factor, PHF	0.90	0.90	0.63	0.81	0.50	0.50
Hourly Flow Rate, HFR	0	0	15	125	104	16
Percent Heavy Vehicles	0	--	--	4	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	8	8	50	8	8	0
Peak Hour Factor, PHF	0.33	0.50	0.69	0.33	0.50	0.90
Hourly Flow Rate, HFR	24	16	72	24	16	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	125		112			40	
C(m) (vph)	1480	1590		782			486	
v/c	0.00	0.08		0.14			0.08	
95% queue length	0.00	0.26		0.50			0.27	
Control Delay	7.4	7.5		10.4			13.1	
LOS	A	A		B			B	
Approach Delay				10.4			13.1	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend AM - Int 5
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	0	0	10	102	52	8
Peak-Hour Factor, PHF	0.90	0.90	0.63	0.81	0.50	0.50
Peak-15 Minute Volume	0	0	4	31	26	4
Hourly Flow Rate, HFR	0	0	15	125	104	16
Percent Heavy Vehicles	0	--	--	4	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	8	8	50	8	8	0
Peak Hour Factor, PHF	0.33	0.50	0.69	0.33	0.50	0.90
Peak-15 Minute Volume	6	4	18	6	4	0
Hourly Flow Rate, HFR	24	16	72	24	16	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	104
Shared ln volume, major rt vehicles:	15	16
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	4	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	4	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 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	120	15	378	378	8	414	377	112
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	8	112
Potential Capacity	1080	947
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1080	947
Probability of Queue free St.	0.93	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	15	120
Potential Capacity	1590	1480
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1590	1480
Probability of Queue free St.	0.92	1.00
Maj L-Shared Prob Q free St.	0.92	1.00

Step 3: TH from Minor St.	8	11
Conflicting Flows	378	377
Potential Capacity	557	558
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity	510	511
Probability of Queue free St.	0.97	0.97

Step 4: LT from Minor St.	7	10
Conflicting Flows	378	414
Potential Capacity	583	552
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.89	0.89
Maj. L, Min T Adj. Imp Factor.	0.91	0.91
Cap. Adj. factor due to Impeding mvmnt	0.91	0.85
Movement Capacity	532	470

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	378	377
Potential Capacity	557	558
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity	510	511

Result for 2 stage process:		
a		
y		
C t	510	511
Probability of Queue free St.	0.97	0.97

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	378	414
Potential Capacity	583	552
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.89	0.89
Maj. L, Min T Adj. Imp Factor.	0.91	0.91
Cap. Adj. factor due to Impeding mvmnt	0.91	0.85
Movement Capacity	532	470

Results for Two-stage process:		
a		
y		
C t	532	470

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	24	16	72	24	16	0
Movement Capacity (vph)	532	510	1080	470	511	947
Shared Lane Capacity (vph)		782			486	

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	532	510	1080	470	511	947
Volume	24	16	72	24	16	0
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		782			486	
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	LTR		LTR			LTR	
v (vph)	0	125		112			40	
C(m) (vph)	1480	1590		782			486	
v/c	0.00	0.08		0.14			0.08	
95% queue length	0.00	0.26		0.50			0.27	
Control Delay	7.4	7.5		10.4			13.1	
LOS	A	A		B			B	
Approach Delay				10.4			13.1	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.92
v(il), Volume for stream 2 or 5	0	104
v(i2), Volume for stream 3 or 6	15	16
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	1.00	0.92
d(M,LT), Delay for stream 1 or 4	7.4	7.5
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.6

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 AM - Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	2	32	148	18	48	0
Peak-Hour Factor, PHF	0.25	0.80	0.58	0.25	0.55	0.90
Hourly Flow Rate, HFR	8	39	255	72	87	0
Percent Heavy Vehicles	0	--	--	11	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	112	0	2	2	2	2
Peak Hour Factor, PHF	0.50	0.90	0.25	0.25	0.25	0.25
Hourly Flow Rate, HFR	224	0	8	8	8	8
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	8	72		232			24	
C(m) (vph)	1522	932		506			554	
v/c	0.01	0.08		0.46			0.04	
95% queue length	0.02	0.25		2.38			0.14	
Control Delay	7.4	9.2		18.0			11.8	
LOS	A	A		C			B	
Approach Delay				18.0			11.8	
Approach LOS				C			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 10:00 AM to 11:00 AM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 AM - Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	32	148	18	48	0
Peak-Hour Factor, PHF	0.25	0.80	0.58	0.25	0.55	0.90
Peak-15 Minute Volume	2	10	64	18	22	0
Hourly Flow Rate, HFR	8	39	255	72	87	0
Percent Heavy Vehicles	0	--	--	11	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	112	0	2	2	2	2
Peak Hour Factor, PHF	0.50	0.90	0.25	0.25	0.25	0.25
Peak-15 Minute Volume	56	0	2	2	2	2
Hourly Flow Rate, HFR	224	0	8	8	8	8
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	39	87
Shared ln volume, major rt vehicles:	255	0
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	11	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	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	4.2	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	11	0	0	0	0	0	0
t(f)	2.2	3.1*	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

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

Computation 2-Proportion of TWSC Intersection Time blocked

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	87	294	421	413	166	417	541	87
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	166	87
Potential Capacity	884	977
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	884	977
Probability of Queue free St.	0.99	0.99

Step 2: LT from Major St.	4	1
Conflicting Flows	294	87
Potential Capacity	932	1522
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	932	1522
Probability of Queue free St.	0.92	0.99
Maj L-Shared Prob Q free St.	0.92	0.99

Step 3: TH from Minor St.	8	11
Conflicting Flows	413	541
Potential Capacity	532	451
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.91	0.91
Movement Capacity	486	412
Probability of Queue free St.	1.00	0.98

Step 4: LT from Minor St.	7	10
Conflicting Flows	421	417
Potential Capacity	546	550
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.90	0.91
Maj. L, Min T Adj. Imp Factor.	0.92	0.93
Cap. Adj. factor due to Impeding mvmnt	0.91	0.92
Movement Capacity	498	509

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	413	541
Potential Capacity	532	451
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.91	0.91
Movement Capacity	486	412

Result for 2 stage process:		
a		
y		
C t	486	412
Probability of Queue free St.	1.00	0.98

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	421	417
Potential Capacity	546	550
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.90	0.91
Maj. L, Min T Adj. Imp Factor.	0.92	0.93
Cap. Adj. factor due to Impeding mvmnt	0.91	0.92
Movement Capacity	498	509

Results for Two-stage process:		
a		
y		
C t	498	509

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	224	0	8	8	8	8
Movement Capacity (vph)	498	486	884	509	412	977
Shared Lane Capacity (vph)		506			554	

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	498	486	884	509	412	977
Volume	224	0	8	8	8	8
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		506			554	
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	LTR		LTR			LTR	
v (vph)	8	72		232			24	
C(m) (vph)	1522	932		506			554	
v/c	0.01	0.08		0.46			0.04	
95% queue length	0.02	0.25		2.38			0.14	
Control Delay	7.4	9.2		18.0			11.8	
LOS	A	A		C			B	
Approach Delay				18.0			11.8	
Approach LOS				C			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	0.92
v(il), Volume for stream 2 or 5	39	87
v(i2), Volume for stream 3 or 6	255	0
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.99	0.92
d(M,LT), Delay for stream 1 or 4	7.4	9.2
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.7

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TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM - Int. 1
East/West Street: PR-250 (Pedro Márquez Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	8	164	4			
Peak-Hour Factor, PHF	0.75	0.75	0.50			
Hourly Flow Rate, HFR	10	218	8			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	6	126	2	20
Peak Hour Factor, PHF	0.90	0.90	0.38	0.74	0.25	0.83
Hourly Flow Rate, HFR	0	0	15	170	8	24
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR			LTR			LTR	
v (vph)	10			15			202	
C(m) (vph)	1636			823			721	
v/c	0.01			0.02			0.28	
95% queue length	0.02			0.06			1.15	
Control Delay	7.2			9.5			11.9	
LOS	A			A			B	
Approach Delay				9.5			11.9	
Approach LOS				A			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 1
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM - Int. 1
East/West Street: PR-250 (Pedro Márquez Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	8	164	4			
Peak-Hour Factor, PHF	0.75	0.75	0.50			
Peak-15 Minute Volume	3	55	2			
Hourly Flow Rate, HFR	10	218	8			
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	6	126	2	20
Peak Hour Factor, PHF	0.90	0.90	0.38	0.74	0.25	0.83
Peak-15 Minute Volume	0	0	4	43	2	6
Hourly Flow Rate, HFR	0	0	15	170	8	24
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	218	
Shared ln volume, major rt vehicles:	8	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1		7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0		0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00		0.00	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		7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20		3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0		0	0	0	0	0	0
t(f)	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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                     (1)              (2)              (3)
for minor                 Single-stage         Two-Stage Process
movements, p(x)             Process          Stage I          Stage II
_______________________________________________________________________________
p(1)
p(4)
p(7)
p(8)
p(9)
p(10)
p(11)
p(12)
_______________________________________________________________________________
Computation 4 and 5
Single-Stage Process
Movement                       1      4      7      8      9     10     11     12
                               L      L      L      T      R      L      T      R
_______________________________________________________________________________
V c,x                         0             258    242    222    250    246    0
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		0		0		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	222	0
Potential Capacity	823	1091
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	823	1091
Probability of Queue free St.	0.98	0.98

Step 2: LT from Major St.	4	1
Conflicting Flows		0
Potential Capacity		1636
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1636
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99

Step 3: TH from Minor St.	8	11
Conflicting Flows	242	246
Potential Capacity	663	660
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	658	655
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10
Conflicting Flows	258	250
Potential Capacity	699	708
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	0.99
Maj. L, Min T Adj. Imp Factor.	0.99	0.99
Cap. Adj. factor due to Impeding mvmnt	0.96	0.98
Movement Capacity	674	691

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	242	246
Potential Capacity	663	660
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity	658	655
Result for 2 stage process:		
a		
y		
C t	658	655
Probability of Queue free St.	1.00	0.99

Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	258	250
Potential Capacity	699	708
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	0.99
Maj. L, Min T Adj. Imp Factor.	0.99	0.99
Cap. Adj. factor due to Impeding mvmnt	0.96	0.98
Movement Capacity	674	691
Results for Two-stage process:		
a		
y		
C t	674	691

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	0	0	15	170	8	24
Movement Capacity (vph)	674	658	823	691	655	1091
Shared Lane Capacity (vph)		823			721	

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	674	658	823	691	655	1091
Volume	0	0	15	170	8	24
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		823			721	
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			LTR			LTR	
v (vph)	10			15			202	
C(m) (vph)	1636			823			721	
v/c	0.01			0.02			0.28	
95% queue length	0.02			0.06			1.15	
Control Delay	7.2			9.5			11.9	
LOS	A			A			B	
Approach Delay				9.5			11.9	
Approach LOS				A			B	

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	218	
v(i2), Volume for stream 3 or 6	8	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.2	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 2
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM - Int. 2
East/West Street: PR-250 (Salisberry Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	26	218				176
Peak-Hour Factor, PHF	0.46	0.86				0.87
Hourly Flow Rate, HFR	56	253				202
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	1				1
Configuration	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						
Peak Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes						
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT							
v (vph)	56							
C(m) (vph)	1382							
v/c	0.04							
95% queue length	0.13							
Control Delay	7.7							
LOS	A							
Approach Delay								
Approach LOS								

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 2
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM - Int. 2
East/West Street: PR-250 (Salisberry Street)
North/South Street: PR-250 (Escudero Street)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	26	218				176
Peak-Hour Factor, PHF	0.46	0.86				0.87
Peak-15 Minute Volume	14	63				51
Hourly Flow Rate, HFR	56	253				202
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	1				1
Configuration	LT					R
Upstream Signal?		No			No	

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

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:	253	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1							
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0							
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00							
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1							
	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							
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0							
t(f)	2.2							

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

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

Computation 4 and 5

Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	202							
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								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

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

Step 2: LT from Major St.	4	1
Conflicting Flows		202
Potential Capacity		1382
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1382
Probability of Queue free St.	1.00	0.96
Maj L-Shared Prob Q free St.		0.95

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	0.95	0.95
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity		

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

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

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

Part 3 - Single Stage

Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity		

Result for 2 stage process:

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

Step 4: LT from Minor St.	7	10

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

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

Part 3 - Single Stage

Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity		

Results for Two-stage process:
a
y
C t

Worksheet 8-Shared Lane Calculations

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

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
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							
v (vph)	56							
C(m) (vph)	1382							
v/c	0.04							
95% queue length	0.13							
Control Delay	7.7							
LOS	A							
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.96	1.00
v(il), Volume for stream 2 or 5	253	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.95	
d(M,LT), Delay for stream 1 or 4	7.7	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.4	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach	Northbound			Southbound		
	Movement	1	2	3	4	5	6
		L	T	R	L	T	R
Volume		86	142	166	86	126	32
Peak-Hour Factor, PHF		0.70	0.67	0.81	0.79	0.78	0.57
Hourly Flow Rate, HFR		122	211	204	108	161	56
Percent Heavy Vehicles		0	--	--	2	--	--
Median Type/Storage		Undivided		/			
RT Channelized?							
Lanes		0	1	0	0	1	0
Configuration			LTR			LTR	
Upstream Signal?			No			No	

Minor Street:	Approach	Westbound			Eastbound		
	Movement	7	8	9	10	11	12
		L	T	R	L	T	R
Volume		132	30	128	24	30	52
Peak Hour Factor, PHF		0.90	0.63	0.77	0.75	0.63	0.81
Hourly Flow Rate, HFR		146	47	166	32	47	64
Percent Heavy Vehicles		0	0	0	0	0	0
Percent Grade (%)			0			0	
Flared Approach:	Exists?/Storage			No /			No /
Lanes		0	1	0	0	1	0
Configuration			LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	122	108		359			143	
C(m) (vph)	1365	1144		232			224	
v/c	0.09	0.09		1.55			0.64	
95% queue length	0.29	0.31		22.00			3.84	
Control Delay	7.9	8.5		304.9			45.7	
LOS	A	A		F			E	
Approach Delay				304.9			45.7	
Approach LOS				F			E	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 3
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM - Int. 3
East/West Street: Local Rd./PR-250 WB
North/South Street: PR-250 NB/ PR-251
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	86	142	166	86	126	32
Peak-Hour Factor, PHF	0.70	0.67	0.81	0.79	0.78	0.57
Peak-15 Minute Volume	31	53	51	27	40	14
Hourly Flow Rate, HFR	122	211	204	108	161	56
Percent Heavy Vehicles	0	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	132	30	128	24	30	52
Peak Hour Factor, PHF	0.90	0.63	0.77	0.75	0.63	0.81
Peak-15 Minute Volume	37	12	42	8	12	16
Hourly Flow Rate, HFR	146	47	166	32	47	64
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	211	161
Shared ln volume, major rt vehicles:	204	56
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	2	0	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	2	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	217	415	1017	990	313	1069	1064	189
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	313	189
Potential Capacity	732	858
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	732	858
Probability of Queue free St.	0.77	0.93

Step 2: LT from Major St.	4	1
Conflicting Flows	415	217
Potential Capacity	1144	1365
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1144	1365
Probability of Queue free St.	0.91	0.91
Maj L-Shared Prob Q free St.	0.89	0.88

Step 3: TH from Minor St.	8	11
Conflicting Flows	990	1064
Potential Capacity	248	225
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.79	0.79
Movement Capacity	195	177
Probability of Queue free St.	0.76	0.73

Step 4: LT from Minor St.	7	10
Conflicting Flows	1017	1069
Potential Capacity	218	201
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.58	0.60
Maj. L, Min T Adj. Imp Factor.	0.67	0.69
Cap. Adj. factor due to Impeding mvmnt	0.62	0.53
Movement Capacity	135	107

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	990	1064
Potential Capacity	248	225
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.79	0.79
Movement Capacity	195	177
Result for 2 stage process:		
a		
y		
C t	195	177
Probability of Queue free St.	0.76	0.73
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	1017	1069
Potential Capacity	218	201
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.58	0.60
Maj. L, Min T Adj. Imp Factor.	0.67	0.69
Cap. Adj. factor due to Impeding mvmnt	0.62	0.53
Movement Capacity	135	107
Results for Two-stage process:		
a		
y		
C t	135	107

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	146	47	166	32	47	64
Movement Capacity (vph)	135	195	732	107	177	858
Shared Lane Capacity (vph)		232			224	

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	135	195	732	107	177	858
Volume	146	47	166	32	47	64
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		232			224	
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	LTR		LTR			LTR	
v (vph)	122	108		359			143	
C(m) (vph)	1365	1144		232			224	
v/c	0.09	0.09		1.55			0.64	
95% queue length	0.29	0.31		22.00			3.84	
Control Delay	7.9	8.5		304.9			45.7	
LOS	A	A		F			E	
Approach Delay				304.9			45.7	
Approach LOS				F			E	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.91	0.91
v(il), Volume for stream 2 or 5	211	161
v(i2), Volume for stream 3 or 6	204	56
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.88	0.89
d(M,LT), Delay for stream 1 or 4	7.9	8.5
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.9	0.9

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 4
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM- Int. 4
East/West Street: PR-250
North/South Street: Resaca Street
Intersection Orientation: EW   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	96	174			182	60
Peak-Hour Factor, PHF	0.67	0.81			0.63	0.60
Hourly Flow Rate, HFR	143	214			288	99
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				18		84
Peak Hour Factor, PHF				0.33		0.85
Hourly Flow Rate, HFR				54		98
Percent Heavy Vehicles				11		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	143						152	
C(m) (vph)	1183						465	
v/c	0.12						0.33	
95% queue length	0.41						1.41	
Control Delay	8.5						16.5	
LOS	A						C	
Approach Delay							16.5	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.6

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

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 4
Jurisdiction: Culebra
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Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM- Int. 4
East/West Street: PR-250
North/South Street: Resaca Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	96	174			182	60
Peak-Hour Factor, PHF	0.67	0.81			0.63	0.60
Peak-15 Minute Volume	36	54			72	25
Hourly Flow Rate, HFR	143	214			288	99
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				18		84
Peak Hour Factor, PHF				0.33		0.85
Peak-15 Minute Volume				14		25
Hourly Flow Rate, HFR				54		98
Percent Heavy Vehicles				11		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	214	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1					7.1		6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0					11		0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00					0.70		0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1					6.5		6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					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					11		0
t(f)	2.2					3.6		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

Computation 2-Proportion of TWSC Intersection Time blocked

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	387					838		338
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		338
Potential Capacity		709
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		709
Probability of Queue free St.	1.00	0.86

Step 2: LT from Major St.	4	1
Conflicting Flows		387
Potential Capacity		1183
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1183
Probability of Queue free St.	1.00	0.88
Maj L-Shared Prob Q free St.		0.86

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	0.86	0.86
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows		838
Potential Capacity		325
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.86	
Maj. L, Min T Adj. Imp Factor.	0.89	
Cap. Adj. factor due to Impeding mvmnt	0.77	0.88
Movement Capacity		286

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	0.86	0.86
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		838
Potential Capacity		325
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.86	
Maj. L, Min T Adj. Imp Factor.	0.89	
Cap. Adj. factor due to Impeding mvmnt	0.77	0.88
Movement Capacity		286
Results for Two-stage process:		
a		
y		
C t		286

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				54		98
Movement Capacity (vph)				286		709
Shared Lane Capacity (vph)					465	

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				286		709
Volume				54		98
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					465	
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)	143						152	
C(m) (vph)	1183						465	
v/c	0.12						0.33	
95% queue length	0.41						1.41	
Control Delay	8.5						16.5	
LOS	A						C	
Approach Delay							16.5	
Approach LOS							C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.88	1.00
v(il), Volume for stream 2 or 5	214	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.86	
d(M,LT), Delay for stream 1 or 4	8.5	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	1.2	

HCS+: Unsignalized Intersections Release 5.6

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Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 5
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM - Int.5
East/West Street: Local Rd./ PR-250 WB
North/South Street: PR-250 SB/ Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	2	8	108	72	0
Peak-Hour Factor, PHF	0.25	0.25	0.50	0.68	0.25	0.90
Hourly Flow Rate, HFR	8	8	16	158	288	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	24	12	22	0	14	0
Peak Hour Factor, PHF	0.75	0.75	0.50	0.90	0.44	0.90
Hourly Flow Rate, HFR	32	16	44	0	31	0
Percent Heavy Vehicles	0	0	9	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	8	158		92			31	
C(m) (vph)	1286	1604		493			345	
v/c	0.01	0.10		0.19			0.09	
95% queue length	0.02	0.33		0.68			0.29	
Control Delay	7.8	7.5		14.0			16.5	
LOS	A	A		B			C	
Approach Delay				14.0			16.5	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

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TWO-WAY STOP CONTROL(TWSC) ANALYSIS

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Analysis Year: 2015
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East/West Street: Local Rd./ PR-250 WB
North/South Street: PR-250 SB/ Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	2	8	108	72	0
Peak-Hour Factor, PHF	0.25	0.25	0.50	0.68	0.25	0.90
Peak-15 Minute Volume	2	2	4	40	72	0
Hourly Flow Rate, HFR	8	8	16	158	288	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	24	12	22	0	14	0
Peak Hour Factor, PHF	0.75	0.75	0.50	0.90	0.44	0.90
Peak-15 Minute Volume	8	4	11	0	8	0
Hourly Flow Rate, HFR	32	16	44	0	31	0
Percent Heavy Vehicles	0	0	9	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	8	288
Shared ln volume, major rt vehicles:	16	0
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	0	0	9	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.3	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	9	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.4	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

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

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

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

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	288	24	652	636	16	666	644	288
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	16	288
Potential Capacity	1043	756
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1043	756
Probability of Queue free St.	0.96	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	24	288
Potential Capacity	1604	1286
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1604	1286
Probability of Queue free St.	0.90	0.99
Maj L-Shared Prob Q free St.	0.88	0.99

Step 3: TH from Minor St.	8	11
Conflicting Flows	636	644
Potential Capacity	398	394
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.88	0.88
Movement Capacity	349	345
Probability of Queue free St.	0.95	0.91

Step 4: LT from Minor St.	7	10
Conflicting Flows	652	666
Potential Capacity	384	376
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.80	0.84
Maj. L, Min T Adj. Imp Factor.	0.84	0.87
Cap. Adj. factor due to Impeding mvmnt	0.84	0.84
Movement Capacity	324	315

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	636	644
Potential Capacity	398	394
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.88	0.88
Movement Capacity	349	345

Result for 2 stage process:		
a		
y		
C t	349	345
Probability of Queue free St.	0.95	0.91

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	652	666
Potential Capacity	384	376
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.80	0.84
Maj. L, Min T Adj. Imp Factor.	0.84	0.87
Cap. Adj. factor due to Impeding mvmnt	0.84	0.84
Movement Capacity	324	315

Results for Two-stage process:		
a		
y		
C t	324	315

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	32	16	44	0	31	0
Movement Capacity (vph)	324	349	1043	315	345	756
Shared Lane Capacity (vph)		493			345	

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	324	349	1043	315	345	756
Volume	32	16	44	0	31	0
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		493			345	
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	LTR		LTR			LTR	
v (vph)	8	158		92			31	
C(m) (vph)	1286	1604		493			345	
v/c	0.01	0.10		0.19			0.09	
95% queue length	0.02	0.33		0.68			0.29	
Control Delay	7.8	7.5		14.0			16.5	
LOS	A	A		B			C	
Approach Delay				14.0			16.5	
Approach LOS				B			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	0.90
v(il), Volume for stream 2 or 5	8	288
v(i2), Volume for stream 3 or 6	16	0
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.99	0.88
d(M,LT), Delay for stream 1 or 4	7.8	7.5
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.9

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	28	204	126	30	0
Peak-Hour Factor, PHF	0.25	0.70	0.44	0.90	0.75	0.90
Hourly Flow Rate, HFR	8	40	463	140	40	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	142	0	4	0	2	0
Peak Hour Factor, PHF	0.58	0.90	0.25	0.90	0.25	0.90
Hourly Flow Rate, HFR	244	0	16	0	8	0
Percent Heavy Vehicles	1	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	8	140		260			8	
C(m) (vph)	1583	1072		367			261	
v/c	0.01	0.13		0.71			0.03	
95% queue length	0.02	0.45		5.24			0.09	
Control Delay	7.3	8.9		35.4			19.2	
LOS	A	A		E			C	
Approach Delay				35.4			19.2	
Approach LOS				E			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: Vanessa Amado
Agency/Co.: VAGTEC
Date Performed: 9/2/2014
Analysis Time Period: 3:45 PM to 4:45 PM
Intersection: 6
Jurisdiction: Culebra
Units: U. S. Customary
Analysis Year: 2015
Project ID: Culebra Transit Impact Study Weekend 2015 PM Int. 6
East/West Street: PR-250
North/South Street: Local Rd.
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	28	204	126	30	0
Peak-Hour Factor, PHF	0.25	0.70	0.44	0.90	0.75	0.90
Peak-15 Minute Volume	2	10	116	35	10	0
Hourly Flow Rate, HFR	8	40	463	140	40	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	142	0	4	0	2	0
Peak Hour Factor, PHF	0.58	0.90	0.25	0.90	0.25	0.90
Peak-15 Minute Volume	61	0	4	0	2	0
Hourly Flow Rate, HFR	244	0	16	0	8	0
Percent Heavy Vehicles	1	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

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

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

Upstream Signal Data

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

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

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	40	40
Shared ln volume, major rt vehicles:	463	0
Sat flow rate, major th vehicles:	1700	1700
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)		4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0	1	0	0	0	0	0
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	1	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 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 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	40	503	612	608	272	616	839	40
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

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

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	272	40
Potential Capacity	772	1037
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	772	1037
Probability of Queue free St.	0.98	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	503	40
Potential Capacity	1072	1583
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1072	1583
Probability of Queue free St.	0.87	0.99
Maj L-Shared Prob Q free St.	0.87	0.99

Step 3: TH from Minor St.	8	11
Conflicting Flows	608	839
Potential Capacity	413	304
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.86	0.86
Movement Capacity	355	261
Probability of Queue free St.	1.00	0.97

Step 4: LT from Minor St.	7	10
Conflicting Flows	612	616
Potential Capacity	407	406
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.83	0.86
Maj. L, Min T Adj. Imp Factor.	0.87	0.89
Cap. Adj. factor due to Impeding mvmnt	0.87	0.87
Movement Capacity	355	355

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	608	839
Potential Capacity	413	304
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.86	0.86
Movement Capacity	355	261

Result for 2 stage process:		
a		
y		
C t	355	261
Probability of Queue free St.	1.00	0.97

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	612	616
Potential Capacity	407	406
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.83	0.86
Maj. L, Min T Adj. Imp Factor.	0.87	0.89
Cap. Adj. factor due to Impeding mvmnt	0.87	0.87
Movement Capacity	355	355

Results for Two-stage process:		
a		
y		
C t	355	355

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	244	0	16	0	8	0
Movement Capacity (vph)	355	355	772	355	261	1037
Shared Lane Capacity (vph)		367			261	

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	355	355	772	355	261	1037
Volume	244	0	16	0	8	0
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		367			261	
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	LTR		LTR			LTR	
v (vph)	8	140		260			8	
C(m) (vph)	1583	1072		367			261	
v/c	0.01	0.13		0.71			0.03	
95% queue length	0.02	0.45		5.24			0.09	
Control Delay	7.3	8.9		35.4			19.2	
LOS	A	A		E			C	
Approach Delay				35.4			19.2	
Approach LOS				E			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	0.87
v(il), Volume for stream 2 or 5	40	40
v(i2), Volume for stream 3 or 6	463	0
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.99	0.87
d(M,LT), Delay for stream 1 or 4	7.3	8.9
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.1	1.2