

# **Appendix I 4**

## **Downtown Couplet Analysis**



December 6, 2011

Mr. Jay Petrek  
City of Escondido  
201 N. Broadway  
Escondido, CA 92025

LLG Reference: 3-10-2000

Subject: **Valley Parkway/2<sup>nd</sup> Avenue Couplet Evaluation – Potential Two-Way Circulation**  
Escondido, CA

Dear Jay:

### ***Introduction***

Linscott, Law & Greenspan (LLG) has been asked to prepare a professional evaluation of the possibility of providing two-way circulation on the Valley Parkway/2<sup>nd</sup> Avenue one-way couplet in the City of Escondido. The City of Escondido is currently updating its General Plan Circulation Element, and while no formal changes to the one-way circulation are proposed as part of this plan, the City has requested a planning-level evaluation of the opportunities and constraints of such a change in the near-term.

Both Valley Parkway and 2<sup>nd</sup> Avenue were studied in detail as part of the City of Escondido's General Plan Update in Mobility Management and Complete Streets Context. LLG prepared the following documents in support of the General Plan Update:

1. *Escondido General Plan Update Traffic Impact Study (LLG 2011)* – citywide intersection and street segment Level of Service calculations, including the “Downtown Specific Plan Area #9”
2. *Escondido General Plan Update Complete Streets Assessment (LLG 2011)* – analysis of pedestrian, bicycle and transit operations
3. *“Downtown Core Analysis” (LLG 2011)* –focused analysis of ten specific intersections and street segments in the Downtown Core area

The above three (3) documents collectively provide vehicular volumes and analysis of the Valley Parkway and 2<sup>nd</sup> Avenue corridors for future vehicular LOS and the existing “complete streets” perspective; however these studies were conducted assuming one-way circulation on the Valley Parkway/2<sup>nd</sup> Avenue couplet would remain in the horizon year analysis, as it exists today. The two-way circulation evaluation provided in this letter relies heavily on work done to-date for volumes, capacities, etc.

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### ***Background***

The Valley Parkway/2<sup>nd</sup> Avenue one-way couplet provides the most direct access to the central downtown core area and eastern residential neighborhoods in the City of Escondido. Currently, the one-way couplet operates from Tulip Street at its western terminus to Hickory Street at its eastern terminus. Valley Parkway generally provides three lanes of westbound travel from Hickory Street to Tulip Street, while 2<sup>nd</sup> Avenue generally provides three lanes of travel in the eastbound direction. Both Valley Parkway and 2<sup>nd</sup> Avenue are generally three lane-lane roadways within the Downtown Core area, except for Valley Parkway west of Maple, where it widens to four-lanes. It widens again to five-lanes west of Escondido Boulevard with a “Queue Jumper” lane for the buses. Valley Parkway and 2<sup>nd</sup> Avenue may be considered the northern and southern geographic boundaries of the central downtown core area. In all, the couplet extends for approximately ten blocks.

The Escondido General Plan Update Traffic Impact Study identified the existing capacities of both Valley Parkway and Second Avenue as 30,000 average daily trips (ADT) at the threshold of LOS E/F. This is the threshold representing the theoretical capacity of the roadway before gridlock conditions, not the “LOS D threshold” capacity utilized for determining significance in the environmental analyses. The value of 30,000 ADT was developed by the City of Escondido, and is based on three lanes of one-way travel, with parking provided on both sides of the street. Using this capacity definition, existing LOS along both corridors with one-way circulation is calculated at LOS C or better. Furthermore, signalized intersection analyses along Valley Parkway and 2<sup>nd</sup> Avenue showed existing LOS C or better peak hour operations. There is little peak hour or daily vehicular congestion along either roadway. Off-peak (mid-day), night-time and weekend operations are even less congested due to lower volumes during these periods.

The Downtown Core analysis identified the existing, typical 3-lane width of both roadways at approximately 52-feet. Each roadway typically consists of two 20-foot wide curb lanes with a 12-foot wide center lane (3 lanes total, 52-foot width). Within the 20-foot wide curb lane is a 12-foot wide travel lane and an 8-foot wide parking lane. At intersections, the three-lane cross-section is typically as follows:

- 1 shared left-thru lane (20')
- 1 thru lane (12')
- 1 shared right-thru lane (20')

### ***Evaluation – Daily and Peak Hour Traffic Volumes***

To evaluate the volumes along the one-way couplet, assuming a change to two-way circulation, LLG evaluated the existing ADT, and the existing AM and PM peak hour volumes at the following six key intersections, commensurate with the analysis periods required and provided in the *Escondido General Plan Update Traffic Impact Study*:

1. Valley Parkway/Escondido Boulevard
2. Valley Parkway/Broadway
3. Valley Parkway/Juniper Street
4. 2<sup>nd</sup> Avenue/Escondido Boulevard
5. 2<sup>nd</sup> Avenue/Broadway
6. 2<sup>nd</sup> Avenue/Juniper Street

A review of ADT's along both corridors (shown in **Table 15-6** in the *Escondido General Plan Update Traffic Impact Study*) indicated that ADT volumes are relatively consistent along each corridor. This reflects the reciprocal use of the couplet by local and regional cut-through traffic. For example, westbound trips along Valley Parkway in the AM peak hour are complemented by reciprocal eastbound trips along 2<sup>nd</sup> Avenue during the PM peak hour, resulting in similar daily traffic volumes for each. Thus, no revisions to street segment ADT would be expected were circulation to be two-way. The overall corridor demand is assumed to remain constant with equal two-way use on each street.

To determine potential changes to peak hour volumes for two-way circulation, LLG manually balanced westbound (Valley Parkway) and eastbound (2<sup>nd</sup> Avenue) peak hour volumes at the six key intersections, assuming again a balanced split along each corridor. This is based on observed, existing ADT on the current one-way couplet. Turn volumes to/from the north/south streets (Escondido Boulevard, Broadway and Juniper Street) were also divided evenly.

### **Daily Traffic Operations**

As stated, the currently accepted capacity for either one-way street is 30,000 ADT at LOS E/F. This means that volumes up to 26,700 ADT (0.89 V/C ratio) result in acceptable LOS D or better operations. The results shown in **Table 15-6** of the *Escondido General Plan Update Traffic Impact Study* indicate LOS C or better operations with volumes generally under 20,000 ADT.

Assuming two-way circulation would be implemented within the existing 52-foot curb-curb width, only a two-lane roadway with a dedicated left-turn lane at intersections could be accommodated. This would allow for continued curbside parking and bike lanes in either direction. There is not sufficient width to construct a four-lane roadway, nor a three-lane, two-way roadway (e.g., two lanes westbound, one lane eastbound). Turn lanes could not be accommodated in 52', nor could curbside parking or bike lanes.

Based on the City's Roadway Capacity table, a "Local Collector" two-lane roadway could be constructed, which is a downgrade in size and capacity from a Major Arterial.

Typically, this roadway provides 42' of curb-curb width and an LOS E/F capacity of 10,000 ADT with parking. However, since 52' would be provided, a higher 15,000 ADT capacity could be assumed because of the additional width (10 feet), which provides less "friction" in the lane, thereby increasing capacity, despite the inclusion of parking.

**Table 1** shows that this reduction in roadway capacity from 30,000 ADT to 15,000 ADT would result in LOS F daily segment operations along both Valley Parkway and 2<sup>nd</sup> Avenue.

#### Peak Hour Operations

LLG completed a planning-level SYNCHRO analysis to determine peak hour LOS operations for the network, including the six intersection in the study area. Geometric assumptions for Valley Parkway and 2<sup>nd</sup> Avenue included dedicated left-turn lanes, and shared through-right lanes in both the eastbound and westbound directions. No changes were assumed to the north/south approaches for Escondido Boulevard, Broadway or Juniper Street. Signal timing parameters were optimized by the program and assumptions for minimum green times to accommodate pedestrians were included. The SYNCHRO calculation sheets showing geometric, signal timing and peak hour volume assumptions are attached to this letter.

**Table 2** shows that acceptable LOS D or better operations would be calculated at these locations under existing conditions, except for the Valley Parkway/Escondido Boulevard intersection, which is calculated to operate at LOS E during the PM peak hour.

While these signalized operations are acceptable at 5 of the 6 locations, future forecast volumes are substantially greater and future intersection LOS at LOS E/F would be expected with buildout of the proposed General Plan Update. Also, future forecast ADT's far exceed the assumed 15,000 ADT capacity of a "Local Collector" in 52-foot of curb-to-curb width.

#### ***Evaluation of Geometrics and Traffic Signals***

- ***Evaluation - Geometrics***

There are several geometric challenges to converting the existing one-way couplet to two-way circulation. To begin with, the couplet termini are designed to facilitate one-way traffic. On the west side of the couplet, Valley Parkway transitions from the two-way couplet to a typical major arterial west of Tulip Street. Grand Avenue diverges eastbound from Valley Parkway at this location and splits again to become 2<sup>nd</sup> Avenue east of Spruce Street. On the east side of the couplet, Valley Boulevard diverges from Valley Parkway at Hickory Street. 2<sup>nd</sup> Avenue ceases to become a one-way eastbound roadway at its intersection with Grand Avenue. Significant geometric improvements would have to occur at both of these locations to accommodate traffic flow in the opposite direction

of the existing one-way flow. The cost for realignment was estimated by the City of Escondido in 2010 at \$10-\$20M.

Alternatively, traffic could be routed around these one-way termini via a series of 90-degree turns on existing roadways, such as Quince Street on the west, and Ivy Street on the east. Neither of these roadways is currently wide enough to accommodate the number of lanes needed to route east/west traffic around the existing adjacent one-way diverge sections.

A review of the existing intersection construction (curb and gutter) shows that they were designed to accommodate one-way circulation. For example, Valley Parkway shows progressive widening moving westbound from Escondido Boulevard as it widens from three lanes to five lanes. Also, some intersections like Valley Parkway and Escondido Boulevard have differential curb return radii (rounded on some corners, squared-off on others) to discourage drivers from making inadvertent turns from the side street into one-way traffic on the major street. Side street approaches would need to be modified to accommodate the following “new” turn movements:

- southbound lefts/northbound rights to Valley Parkway
- southbound rights/northbound left to 2<sup>nd</sup> Avenue

These geometric issues would need to be addressed and remedied along both corridors for the extent of the proposed two-way circulation.

- ***Evaluation – Traffic Signal Modification***

A staff report to City Council in December 2010 identified 14 existing traffic signals that would require modification to accommodate two-way traffic volumes. At a minimum, traffic signal modification plans would be required at each location, and additional equipment (loop or video detectors, standards, mast arms, signal heads, pedestrian heads, luminaires, etc) would be required. The City’s cost estimate for design and construction in 2010 for this work was \$4.5M. However, this estimate could be revised upwards when considering that all signal equipment would need to be brought up to the latest standards, and Americans with Disabilities Act (ADA) – compliant ramps and sidewalks would also be required. It would not be feasible to replace traffic signals with stop signs based on existing and forecasted traffic volumes.

***Summary and Conclusions***

In summary, the analysis of a potential two-way circulation plan for the existing one-way couplet on Valley Parkway and 2<sup>nd</sup> Avenue determined the following:

1. Both Valley Parkway and 2<sup>nd</sup> Avenue would be limited to two-lane roadways with parking (one-lane each direction) due to existing curb-to-curb restrictions that preclude four-lane roadways with turn pockets, parking and bike lanes
2. Street segment analysis shows severe deficiencies in daily LOS along both roadways with the reduced capacity. ***Significant impacts would be calculated*** for the Project EIR along the length of the couplet on both Valley Parkway and 2<sup>nd</sup> Avenue
3. Existing peak hour volumes could be accommodated with acceptable LOS at five of six intersections studied. Unacceptable LOS was calculated at one intersection, ***which is considered a significant unmitigable impact***
4. Traffic volumes are forecasted to increase by about 50% throughout the downtown core area by 2035. Intersections along the revised, two-way couplet would not functionally accommodate the growth in downtown core area
5. Revision of the existing street system from one-way to two-way circulation would require major geometric modifications to existing intersections, including changing curb/gutter alignments, and installing extensive traffic signal equipment/modifications, signage, striping and ADA improvements

Sincerely,

**Linscott, Law & Greenspan, Engineers**

Chris Mendiara  
Associate Principal

cc: Diane Sandman, Atkins  
Attachments: Attachment A: SYNCHRO Calculation Sheets

**TABLE 1  
STREET SEGMENT OPERATIONS  
EXISTING VOLUMES – TWO-WAY CIRCULATION**

Street Segment	Existing One-Way Circulation					Proposed Two-Way Circulation				
	Currently Built As	Capacity (LOS E) <sup>a</sup>	ADT <sup>b</sup>	LOS <sup>c</sup>	V/C <sup>d</sup>	Classification	Capacity (LOS E)	ADT	LOS	V/C
<b>Valley Parkway</b>										
Tulip Street to Quince Street	3-lanes <sup>e</sup>	30,000	21,000	C	0.70	2-lane Local Collector	15,000	21,000	F	1.40
Quince Street to Centre City Parkway	3-lanes	30,000	18,900	C	0.63	2-lane Local Collector	15,000	18,900	F	1.26
Centre City Parkway to Escondido Boulevard	5-lanes <sup>f</sup>	43,500	20,700	B	0.48	2-lane Local Collector	15,000	20,700	F	1.38
Escondido Boulevard to Broadway	3-lanes	30,000	18,700	C	0.62	2-lane Local Collector	15,000	18,700	F	1.25
Broadway to Juniper Street	3-lanes	30,000	17,000	C	0.57	2-lane Local Collector	15,000	17,000	F	1.13
Juniper Street to Hickory Street	3-lanes	30,000	14,000	B	0.47	2-lane Local Collector	15,000	14,000	E	0.93
<b>2<sup>nd</sup> Avenue</b>										
Grand Avenue to Quince Street	3-lanes	30,000	19,800	C	0.66	2-lane Local Collector	15,000	19,800	F	1.32
Quince Street to Centre City Parkway	3-lanes	30,000	17,700	C	0.59	2-lane Local Collector	15,000	17,700	F	1.18
Centre City Parkway to Escondido Boulevard	3-lanes	30,000	20,200	C	0.67	2-lane Local Collector	15,000	20,200	F	1.35
Escondido Boulevard to Broadway	3-lanes	30,000	17,300	C	0.58	2-lane Local Collector	15,000	17,300	F	1.15
Broadway to Juniper Street	3-lanes	30,000	17,000	C	0.57	2-lane Local Collector	15,000	17,000	F	1.13
Juniper Street to Hickory Street	3-lanes	30,000	15,900	B	0.53	2-lane Local Collector	15,000	15,900	F	1.06

**Footnotes:**

- a. Capacities based on City of Escondido' Roadway Classification Table, and represent the theoretical threshold at gridlock (LOS E/F).
- b. Average Daily Traffic Volumes. (Based on counts provided by the City of Escondido (2006)):
- c. Level of Service.
- d. Volume to Capacity.
- e. Roadway currently built as three lanes traveling in one direction. Capacity of 30,000 ADT used in analysis.
- f. Roadway currently built as five lanes traveling in one direction. Average of 4-Ln Major and 6-Ln Super Major capacity used in analysis.

**TABLE 2  
 INTERSECTION OPERATIONS  
 EXISTING VOLUMES – TWO-WAY CIRCULATION**

Intersection	Control Type	Peak Hour	Existing One-Way Circulation		Proposed Two-Way Circulation	
			Delay <sup>a</sup>	LOS <sup>b</sup>	Delay	LOS
Valley Parkway/ Escondido Boulevard	Signal	AM	13.7	B	31.7	C
		PM	18.2	B	55.9	E
Valley Parkway/ Broadway	Signal	AM	15.7	B	20.6	C
		PM	17.1	B	17.9	B
Valley Parkway/ Juniper Street	Signal	AM	10.6	B	19.1	C
		PM	11.9	B	24.2	C
2 <sup>nd</sup> Avenue/ Escondido Boulevard	Signal	AM	14.4	B	27.7	C
		PM	16.3	B	42.1	D
2 <sup>nd</sup> Avenue/ Broadway	Signal	AM	10.5	B	9.7	A
		PM	11.0	B	13.6	B
2 <sup>nd</sup> Avenue/ Juniper Street	Signal	AM	7.2	A	10.3	B
		PM	9.3	A	11.0	B

**Footnotes:**

- a. Average delay expressed in seconds per vehicle.
- b. Level of Service.

SIGNALIZED	
DELAY/LOS THRESHOLDS	
Delay	LOS
0.0 ≤ 10.0	A
10.1 to 20.0	B
20.1 to 35.0	C
35.1 to 55.0	D
55.1 to 80.0	E
≥ 80.1	F

# ATTACHMENT A<sub>1</sub>

## PEAK HOUR INTERSECTION ANALYSIS WORKSHEETS EXISTING ONE-WAY OPERATIONS



HCM Signalized Intersection Capacity Analysis

22: Valley Pkwy & Escondido Blvd

10/10/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				← ↑ →	← ↑ →	← ↑ →	← ↑ →	← ↑ →			← ↑ →	
Volume (vph)	0	0	0	75	1195	89	56	328	0	0	549	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0			5.0	5.0				5.0
Lane Util. Factor				0.86			1.00	0.95				0.95
Frt				0.99			1.00	1.00				0.97
Flt Protected				1.00			0.95	1.00				1.00
Satd. Flow (prot)				6327			1770	3539				3450
Flt Permitted				1.00			0.95	1.00				1.00
Satd. Flow (perm)				6327			1770	3539				3450
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	82	1299	97	61	357	0	0	597	120
RTOR Reduction (vph)	0	0	0	0	14	0	0	0	0	0	19	0
Lane Group Flow (vph)	0	0	0	0	1464	0	61	357	0	0	698	0
Turn Type				Perm			Prot					
Protected Phases					6		3	8				4
Permitted Phases				6								
Actuated Green, G (s)					28.0		4.2	42.0				32.8
Effective Green, g (s)					28.0		4.2	42.0				32.8
Actuated g/C Ratio					0.35		0.05	0.52				0.41
Clearance Time (s)					5.0		5.0	5.0				5.0
Vehicle Extension (s)					2.0		3.0	2.0				2.0
Lane Grp Cap (vph)					2214		93	1858				1415
v/s Ratio Prot							c0.03	0.10				c0.20
v/s Ratio Perm					0.23							
v/c Ratio					0.66		0.66	0.19				0.49
Uniform Delay, d1					22.0		37.2	10.0				17.5
Progression Factor					0.42		0.75	1.52				1.00
Incremental Delay, d2					1.4		15.3	0.2				1.2
Delay (s)					10.7		43.2	15.4				18.7
Level of Service					B		D	B				B
Approach Delay (s)		0.0			10.7			19.5				18.7
Approach LOS		A			B			B				B

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

22: Valley Pkwy & Escondido Blvd

10/10/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				← ↑ →	← ↑ →	← ↑ →	← ↑ →	← ↑ →			← ↑ →	
Volume (vph)	0	0	0	128	1254	237	76	664	0	0	496	192
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0			5.0	5.0				5.0
Lane Util. Factor				0.86			1.00	0.95				0.95
Frt				0.98			1.00	1.00				0.96
Flt Protected				1.00			0.95	1.00				1.00
Satd. Flow (prot)				6242			1770	3539				3391
Flt Permitted				1.00			0.95	1.00				1.00
Satd. Flow (perm)				6242			1770	3539				3391
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	139	1363	258	83	722	0	0	539	209
RTOR Reduction (vph)	0	0	0	0	35	0	0	0	0	0	43	0
Lane Group Flow (vph)	0	0	0	0	1725	0	83	722	0	0	705	0
Turn Type				Perm			Prot					
Protected Phases					6		3	8				4
Permitted Phases				6								
Actuated Green, G (s)					36.0		7.0	44.0				32.0
Effective Green, g (s)					36.0		7.0	44.0				32.0
Actuated g/C Ratio					0.40		0.08	0.49				0.36
Clearance Time (s)					5.0		5.0	5.0				5.0
Vehicle Extension (s)					2.0		3.0	2.0				2.0
Lane Grp Cap (vph)					2497		138	1730				1206
v/s Ratio Prot							c0.05	0.20				c0.21
v/s Ratio Perm					0.28							
v/c Ratio					0.69		0.60	0.42				0.58
Uniform Delay, d1					22.4		40.2	14.8				23.6
Progression Factor					0.62		0.91	1.40				1.00
Incremental Delay, d2					1.5		6.9	0.7				2.1
Delay (s)					15.3		43.5	21.4				25.7
Level of Service					B		D	C				C
Approach Delay (s)		0.0			15.3			23.6				25.7
Approach LOS		A			B			C				C

Intersection Summary			
HCM Average Control Delay	19.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

23: Valley Pkwy & Broadway

10/10/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑↑	↑	↑↑	↑↑			↑↑	↑
Volume (vph)	0	0	0	24	1184	105	27	207	0	0	341	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0			5.0	5.0
Lane Util. Factor					0.91	1.00	1.00	0.95			0.95	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					5080	1583	1770	3539			3539	1583
Flt Permitted					1.00	1.00	0.52	1.00			1.00	1.00
Satd. Flow (perm)					5080	1583	963	3539			3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	26	1287	114	29	225	0	0	371	129
RTOR Reduction (vph)	0	0	0	0	0	60	0	0	0	0	0	17
Lane Group Flow (vph)	0	0	0	0	1313	54	29	225	0	0	371	112
Turn Type				Split		Perm		Perm				Perm
Protected Phases				6	6		8				4	
Permitted Phases						6	8					4
Actuated Green, G (s)					38.0	38.0	32.0	32.0			32.0	32.0
Effective Green, g (s)					38.0	38.0	32.0	32.0			32.0	32.0
Actuated g/C Ratio					0.48	0.48	0.40	0.40			0.40	0.40
Clearance Time (s)					5.0	5.0	5.0	5.0			5.0	5.0
Vehicle Extension (s)					2.5	2.5	2.5	2.5			2.5	2.5
Lane Grp Cap (vph)					2413	752	385	1416			1416	633
v/s Ratio Prot					c0.26			0.06			c0.10	
v/s Ratio Perm						0.03	0.03					0.07
v/c Ratio					0.54	0.07	0.08	0.16			0.26	0.18
Uniform Delay, d1					14.9	11.4	14.8	15.4			16.1	15.5
Progression Factor					1.00	1.00	0.66	0.73			1.00	1.00
Incremental Delay, d2					0.9	0.2	0.1	0.0			0.5	0.6
Delay (s)					15.8	11.6	9.9	11.3			16.5	16.1
Level of Service					B	B	A	B			B	B
Approach Delay (s)		0.0			15.4			11.1			16.4	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

23: Valley Pkwy & Broadway

10/10/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑↑	↑	↑↑	↑↑			↑↑	↑
Volume (vph)	0	0	0	28	1247	140	64	303	0	0	274	164
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0			5.0	5.0
Lane Util. Factor					0.91	1.00	1.00	0.95			0.95	1.00
Frt					1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected					1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					5080	1583	1770	3539			3539	1583
Flt Permitted					1.00	1.00	0.56	1.00			1.00	1.00
Satd. Flow (perm)					5080	1583	1051	3539			3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	30	1355	152	70	329	0	0	298	178
RTOR Reduction (vph)	0	0	0	0	0	74	0	0	0	0	0	19
Lane Group Flow (vph)	0	0	0	0	1385	78	70	329	0	0	298	159
Turn Type				Split		Perm		Perm				Perm
Protected Phases				6	6		8				4	
Permitted Phases						6	8					4
Actuated Green, G (s)					46.0	46.0	34.0	34.0			34.0	34.0
Effective Green, g (s)					46.0	46.0	34.0	34.0			34.0	34.0
Actuated g/C Ratio					0.51	0.51	0.38	0.38			0.38	0.38
Clearance Time (s)					5.0	5.0	5.0	5.0			5.0	5.0
Vehicle Extension (s)					2.5	2.5	2.5	2.5			2.5	2.5
Lane Grp Cap (vph)					2596	809	397	1337			1337	598
v/s Ratio Prot					c0.27			0.09			c0.10	
v/s Ratio Perm						0.05	0.07					c0.10
v/c Ratio					0.53	0.10	0.18	0.25			0.22	0.27
Uniform Delay, d1					14.8	11.3	18.7	19.2			19.0	19.4
Progression Factor					1.00	1.00	0.48	0.51			1.00	1.00
Incremental Delay, d2					0.8	0.2	0.2	0.1			0.4	1.1
Delay (s)					15.6	11.5	9.2	9.9			19.4	20.5
Level of Service					B	B	A	A			B	C
Approach Delay (s)		0.0			15.2			9.8			19.8	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

43: Valley Pkwy & Juniper Street

10/10/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↕↕↕	↕↕↕		↕	↕			↕	↕
Volume (vph)	0	0	0	19	1401	67	25	106	0	0	174	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0		5.0	5.0				5.0
Lane Util. Factor					0.91		1.00	1.00				1.00
Frt					0.99		1.00	1.00				0.95
Flt Protected					1.00		0.95	1.00				1.00
Satd. Flow (prot)					5048		1770	1863				1775
Flt Permitted					1.00		0.46	1.00				1.00
Satd. Flow (perm)					5048		854	1863				1775
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	21	1523	73	27	115	0	0	189	102
RTOR Reduction (vph)	0	0	0	0	6	0	0	0	0	0	13	0
Lane Group Flow (vph)	0	0	0	0	1611	0	27	115	0	0	278	0
Turn Type				Split		Perm						
Protected Phases				8	8		2				6	
Permitted Phases							2					
Actuated Green, G (s)					32.3		14.9	14.9			14.9	
Effective Green, g (s)					32.3		14.9	14.9			14.9	
Actuated g/C Ratio					0.56		0.26	0.26			0.26	
Clearance Time (s)					5.0		5.0	5.0			5.0	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					2851		222	485			462	
v/s Ratio Prot					c0.32			0.06			c0.16	
v/s Ratio Perm							0.03					
v/c Ratio					0.57		0.12	0.24			0.60	
Uniform Delay, d1					8.0		16.2	16.7			18.6	
Progression Factor					1.00		1.00	1.00			1.00	
Incremental Delay, d2					0.3		0.2	0.3			2.2	
Delay (s)					8.2		16.4	16.9			20.8	
Level of Service					A		B	B			C	
Approach Delay (s)		0.0			8.2			16.8			20.8	
Approach LOS		A			A			B			C	

Intersection Summary			
HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	57.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

43: Valley Pkwy & Juniper St

10/10/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↕↕↕	↕↕↕		↕	↕			↕	↕
Volume (vph)	0	0	0	22	1476	153	59	155	0	0	140	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0		5.0	5.0				5.0
Lane Util. Factor					0.91		1.00	1.00				1.00
Frt					0.99		1.00	1.00				0.94
Flt Protected					1.00		0.95	1.00				1.00
Satd. Flow (prot)					5011		1770	1863				1742
Flt Permitted					1.00		0.42	1.00				1.00
Satd. Flow (perm)					5011		780	1863				1742
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	24	1604	166	64	168	0	0	152	141
RTOR Reduction (vph)	0	0	0	0	12	0	0	0	0	0	13	0
Lane Group Flow (vph)	0	0	0	0	1782	0	64	168	0	0	280	0
Turn Type				Split		Perm						
Protected Phases				8	8		2				6	
Permitted Phases							2					
Actuated Green, G (s)					39.4		16.5	16.5			16.5	
Effective Green, g (s)					39.4		16.5	16.5			16.5	
Actuated g/C Ratio					0.60		0.25	0.25			0.25	
Clearance Time (s)					5.0		5.0	5.0			5.0	
Vehicle Extension (s)					3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)					2996		195	466			436	
v/s Ratio Prot					c0.36			0.09			c0.16	
v/s Ratio Perm							0.08					
v/c Ratio					0.59		0.33	0.36			0.64	
Uniform Delay, d1					8.3		20.2	20.4			22.1	
Progression Factor					1.00		1.00	1.00			1.00	
Incremental Delay, d2					0.3		1.0	0.5			3.2	
Delay (s)					8.6		21.2	20.8			25.3	
Level of Service					A		C	C			C	
Approach Delay (s)		0.0			8.6			20.9			25.3	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	11.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	65.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

30: Second Ave & Escondido Blvd

10/10/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔↔↔						↕		↔	↕		
Volume (vph)	61	961	54	0	0	0	0	541	131	67	570	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		5.0						5.0		5.0			
Lane Util. Factor		0.91						0.95		1.00	0.95		
Frt		0.99						0.97		1.00	1.00		
Flt Protected		1.00						1.00		0.95	1.00		
Satd. Flow (prot)		5033						3436		1770	3539		
Flt Permitted		1.00						1.00		0.19	1.00		
Satd. Flow (perm)		5033						3436		357	3539		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	66	1045	59	0	0	0	0	588	142	73	620	0	
RTOR Reduction (vph)	0	5	0	0	0	0	0	32	0	0	0	0	
Lane Group Flow (vph)	0	1165	0	0	0	0	0	698	0	73	620	0	
Turn Type	Perm									Perm			
Protected Phases	2									8			4
Permitted Phases	2									4			
Actuated Green, G (s)	48.0									22.0			22.0
Effective Green, g (s)	48.0									22.0			22.0
Actuated g/C Ratio	0.60									0.28			0.28
Clearance Time (s)	5.0									5.0			5.0
Vehicle Extension (s)	2.0									2.0			2.0
Lane Grp Cap (vph)	3020									945			973
v/s Ratio Prot										0.20			0.18
v/s Ratio Perm	0.23												c0.20
v/c Ratio	0.39									0.74			0.64
Uniform Delay, d1	8.3									26.4			25.5
Progression Factor	0.33									1.00			0.51
Incremental Delay, d2	0.3									2.6			1.0
Delay (s)	3.1									29.0			14.0
Level of Service	A									C			B
Approach Delay (s)	3.1			0.0			29.0			16.3			
Approach LOS	A			A			C			B			

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

30: Second Ave & Escondido Blvd

10/10/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔↔↔						↕		↔	↕		
Volume (vph)	111	1443	106	0	0	0	0	579	215	96	592	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		5.0						5.0		5.0			
Lane Util. Factor		0.91						0.95		1.00	0.95		
Frt		0.99						0.96		1.00	1.00		
Flt Protected		1.00						1.00		0.95	1.00		
Satd. Flow (prot)		5020						3395		1770	3539		
Flt Permitted		1.00						1.00		0.17	1.00		
Satd. Flow (perm)		5020						3395		312	3539		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	121	1568	115	0	0	0	0	629	234	104	643	0	
RTOR Reduction (vph)	0	7	0	0	0	0	0	5	0	0	0	0	
Lane Group Flow (vph)	0	1797	0	0	0	0	0	858	0	104	643	0	
Turn Type	Perm									Perm			
Protected Phases	2									8			4
Permitted Phases	2									4			
Actuated Green, G (s)	49.3									30.7			30.7
Effective Green, g (s)	49.3									30.7			30.7
Actuated g/C Ratio	0.55									0.34			0.34
Clearance Time (s)	5.0									5.0			5.0
Vehicle Extension (s)	2.0									2.0			2.0
Lane Grp Cap (vph)	2750									1158			1207
v/s Ratio Prot										0.25			0.18
v/s Ratio Perm	0.36												c0.33
v/c Ratio	0.65									0.74			0.53
Uniform Delay, d1	14.3									26.1			23.9
Progression Factor	0.18									1.00			0.75
Incremental Delay, d2	0.7									2.3			0.2
Delay (s)	3.2									28.4			18.2
Level of Service	A									C			B
Approach Delay (s)	3.2			0.0			28.4			30.1			
Approach LOS	A			A			C			C			

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

31: Second Ave & Broadway

10/10/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↕↔						↕		↕	↕	
Volume (vph)	35	683	16	0	0	0	0	54	6	80	100	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0		5.0	5.0	
Lane Util. Factor		0.91						1.00		1.00	1.00	
Frt		1.00						0.99		1.00	1.00	
Flt Protected		1.00						1.00		0.95	1.00	
Satd. Flow (prot)		5057						1836		1770	1863	
Flt Permitted		1.00						1.00		0.71	1.00	
Satd. Flow (perm)		5057						1836		1330	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	742	17	0	0	0	0	59	7	87	109	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	793	0	0	0	0	0	64	0	87	109	0
Turn Type	Split									Perm		
Protected Phases	4	4						2			6	
Permitted Phases										6		
Actuated Green, G (s)		18.5						51.5		51.5	51.5	
Effective Green, g (s)		18.5						51.5		51.5	51.5	
Actuated g/C Ratio		0.23						0.64		0.64	0.64	
Clearance Time (s)		5.0						5.0		5.0	5.0	
Vehicle Extension (s)		2.0						2.0		2.0	2.0	
Lane Grp Cap (vph)		1169						1182		856	1199	
v/s Ratio Prot		c0.16						0.03			0.06	
v/s Ratio Perm										c0.07		
v/c Ratio		0.68						0.05		0.10	0.09	
Uniform Delay, d1		28.0						5.3		5.4	5.4	
Progression Factor		0.53						1.00		0.53	0.54	
Incremental Delay, d2		1.2						0.1		0.2	0.1	
Delay (s)		16.0						5.3		3.1	3.0	
Level of Service		B						A		A	A	
Approach Delay (s)		16.0			0.0			5.3			3.1	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	33.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

31: Second Ave & Broadway

10/10/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↕↔						↕		↕	↕	
Volume (vph)	76	1292	26	0	0	0	0	174	10	80	100	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0		5.0	5.0	
Lane Util. Factor		0.91						1.00		1.00	1.00	
Frt		1.00						0.99		1.00	1.00	
Flt Protected		1.00						1.00		0.95	1.00	
Satd. Flow (prot)		5057						1849		1770	1863	
Flt Permitted		1.00						1.00		0.62	1.00	
Satd. Flow (perm)		5057						1849		1150	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	1404	28	0	0	0	0	189	11	87	109	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	1512	0	0	0	0	0	198	0	87	109	0
Turn Type	Split									Perm		
Protected Phases	4	4						2			6	
Permitted Phases										6		
Actuated Green, G (s)		37.8						42.2		42.2	42.2	
Effective Green, g (s)		37.8						42.2		42.2	42.2	
Actuated g/C Ratio		0.42						0.47		0.47	0.47	
Clearance Time (s)		5.0						5.0		5.0	5.0	
Vehicle Extension (s)		2.0						2.0		2.0	2.0	
Lane Grp Cap (vph)		2124						867		539	874	
v/s Ratio Prot		c0.30						c0.11			0.06	
v/s Ratio Perm										0.08		
v/c Ratio		0.71						0.23		0.16	0.12	
Uniform Delay, d1		21.6						14.2		13.7	13.5	
Progression Factor		0.42						1.00		0.38	0.38	
Incremental Delay, d2		0.7						0.6		0.6	0.3	
Delay (s)		9.8						14.8		5.8	5.4	
Level of Service		A						B		A	A	
Approach Delay (s)		9.8			0.0			14.8			5.6	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

45: Second Ave & Juniper Street

10/10/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↕↔						↕		↕	↕	
Volume (vph)	37	655	23	0	0	0	0	75	9	82	139	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0						5.0		5.0	5.0	
Lane Util. Factor		0.91						1.00		1.00	1.00	
Frt		1.00						0.99		1.00	1.00	
Flt Protected		1.00						1.00		0.95	1.00	
Satd. Flow (prot)		5048						1835		1770	1863	
Flt Permitted		1.00						1.00		0.70	1.00	
Satd. Flow (perm)		5048						1835		1299	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	712	25	0	0	0	0	82	10	89	151	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	8	0	0	0	0
Lane Group Flow (vph)	0	772	0	0	0	0	0	84	0	89	151	0
Turn Type	Split									Perm		
Protected Phases	4	4						2			6	
Permitted Phases										6		
Actuated Green, G (s)		13.8						7.8		7.8	7.8	
Effective Green, g (s)		13.8						7.8		7.8	7.8	
Actuated g/C Ratio		0.44						0.25		0.25	0.25	
Clearance Time (s)		5.0						5.0		5.0	5.0	
Vehicle Extension (s)		3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)		2205						453		321	460	
v/s Ratio Prot		c0.15						0.05			c0.08	
v/s Ratio Perm										0.07		
v/c Ratio		0.35						0.19		0.28	0.33	
Uniform Delay, d1		5.9						9.4		9.6	9.8	
Progression Factor		1.00						1.00		1.00	1.00	
Incremental Delay, d2		0.1						0.2		0.5	0.4	
Delay (s)		6.0						9.6		10.1	10.2	
Level of Service		A						A		B	B	
Approach Delay (s)		6.0			0.0			9.6			10.1	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM Average Control Delay	7.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	31.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	33.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

45: Second Ave & Juniper St

10/10/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↕↔						↕		↕	↕	
Volume (vph)	79	1239	38	0	0	0	0	241	14	82	139	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0		4.0	4.0	
Lane Util. Factor		0.91						1.00		1.00	1.00	
Frt		1.00						0.99		1.00	1.00	
Flt Protected		1.00						1.00		0.95	1.00	
Satd. Flow (prot)		5049						1849		1770	1863	
Flt Permitted		1.00						1.00		0.48	1.00	
Satd. Flow (perm)		5049						1849		895	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	1347	41	0	0	0	0	262	15	89	151	0
RTOR Reduction (vph)	0	3	0	0	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	1471	0	0	0	0	0	274	0	89	151	0
Turn Type	Split									Perm		
Protected Phases	4	4						2			6	
Permitted Phases										6		
Actuated Green, G (s)		28.3						14.1		14.1	14.1	
Effective Green, g (s)		28.3						14.1		14.1	14.1	
Actuated g/C Ratio		0.56						0.28		0.28	0.28	
Clearance Time (s)		4.0						4.0		4.0	4.0	
Vehicle Extension (s)		3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)		2835						517		250	521	
v/s Ratio Prot		c0.29						c0.15			0.08	
v/s Ratio Perm										0.10		
v/c Ratio		0.52						0.53		0.36	0.29	
Uniform Delay, d1		6.8						15.3		14.5	14.2	
Progression Factor		1.00						1.00		1.00	1.00	
Incremental Delay, d2		0.2						1.0		0.9	0.3	
Delay (s)		7.0						16.4		15.4	14.5	
Level of Service		A						B		B	B	
Approach Delay (s)		7.0			0.0			16.4			14.9	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	50.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

## ATTACHMENT A<sub>2</sub>

### PEAK HOUR INTERSECTION ANALYSIS WORKSHEETS PROPOSED TWO-WAY OPERATIONS



Escondido GP Update - Two-Way Couplet  
1: Valley Pkwy & Escondido Blvd

12/20/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	30	480	27	37	598	45	28	328	66	274	506	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	0.99		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1848		1770	1843		1770	3450		1770	3487	
Flt Permitted	0.10	1.00		0.21	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	189	1848		383	1843		1770	3450		1770	3487	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	522	29	40	650	49	30	357	72	298	550	60
RTOR Reduction (vph)	0	2	0	0	3	0	0	16	0	0	8	0
Lane Group Flow (vph)	33	549	0	40	696	0	30	413	0	298	602	0
Turn Type	Perm		Perm		Prot		Prot		Prot		Prot	
Protected Phases	2		6		3		8		7		4	
Permitted Phases	2		6		3		8		7		4	
Actuated Green, G (s)	39.4	39.4		39.4	39.4		3.6	27.1		18.5	42.0	
Effective Green, g (s)	39.4	39.4		39.4	39.4		3.6	27.1		18.5	42.0	
Actuated g/C Ratio	0.39	0.39		0.39	0.39		0.04	0.27		0.18	0.42	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		2.0	2.0		3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)	74	728		151	726		64	935		327	1465	
v/s Ratio Prot	0.30		c0.38		0.02		c0.12		c0.17		0.17	
v/s Ratio Perm	0.17		0.10		0.47		0.44		0.91		0.41	
v/c Ratio	0.45	0.75		0.26	0.96		0.47	0.44		0.91	0.41	
Uniform Delay, d1	22.3	26.1		20.5	29.5		47.3	30.2		39.9	20.3	
Progression Factor	1.00	1.00		0.77	0.66		0.39	0.17		1.00	1.00	
Incremental Delay, d2	18.2	7.1		3.3	20.9		4.5	1.3		28.3	0.9	
Delay (s)	40.5	33.3		19.1	40.3		22.8	6.4		68.3	21.2	
Level of Service	D		C		D		A		E		C	
Approach Delay (s)	33.7			39.2			7.5			36.6		
Approach LOS	C			D			A			D		

Intersection Summary			
HCM Average Control Delay	31.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet  
1: Valley Pkwy & Escondido Blvd

12/20/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	105	721	53	64	627	119	38	664	107	248	475	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	0.98		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1843		1770	1818		1770	3466		1770	3450	
Flt Permitted	0.09	1.00		0.07	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	176	1843		133	1818		1770	3466		1770	3450	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	784	58	70	682	129	41	722	116	270	516	104
RTOR Reduction (vph)	0	3	0	0	6	0	0	11	0	0	14	0
Lane Group Flow (vph)	114	840	0	70	805	0	41	827	0	270	606	0
Turn Type	Perm		Perm		Prot		Prot		Prot		Prot	
Protected Phases	2		6		3		8		7		4	
Permitted Phases	2		6		3		8		7		4	
Actuated Green, G (s)	60.0	60.0		60.0	60.0		4.8	27.0		18.0	40.2	
Effective Green, g (s)	60.0	60.0		60.0	60.0		4.8	27.0		18.0	40.2	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.04	0.22		0.15	0.34	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		2.0	2.0		3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)	88	922		67	909		71	780		266	1156	
v/s Ratio Prot	0.46		0.44		0.02		c0.24		c0.15		0.18	
v/s Ratio Perm	c0.65		0.53		1.04		1.06		1.02		0.52	
v/c Ratio	1.30	0.91		1.04	0.89		0.58	1.06		1.02	0.52	
Uniform Delay, d1	30.0	27.5		30.0	26.9		56.6	46.5		51.0	32.2	
Progression Factor	1.00	1.00		0.58	0.57		0.83	0.52		1.00	1.00	
Incremental Delay, d2	194.3	14.6		113.8	10.7		7.5	44.1		59.1	1.7	
Delay (s)	224.3	42.1		131.2	26.1		54.2	68.1		110.1	33.9	
Level of Service	F		D		E		E		F		C	
Approach Delay (s)	63.8			34.5			67.5			57.0		
Approach LOS	E			C			E			E		

Intersection Summary			
HCM Average Control Delay	55.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	98.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet  
2: Valley Pkwy & Broadway

12/20/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	17	341	8	12	592	103	14	207	3	40	229	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00		1.00	0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1856		1770	1821		1770	3532		1770	3539	1583
Flt Permitted	0.18	1.00		0.47	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	343	1856		867	1821		1770	3532		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	371	9	13	643	112	15	225	3	43	249	120
RTOR Reduction (vph)	0	1	0	0	6	0	0	1	0	0	0	85
Lane Group Flow (vph)	18	379	0	13	749	0	15	227	0	43	249	35
Turn Type	Perm	Perm		Perm	Perm		Prot	Prot		Prot	Perm	Perm
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								4
Actuated Green, G (s)	54.4	54.4		54.4	54.4		1.6	27.4		3.2	29.0	29.0
Effective Green, g (s)	54.4	54.4		54.4	54.4		1.6	27.4		3.2	29.0	29.0
Actuated g/C Ratio	0.54	0.54		0.54	0.54		0.02	0.27		0.03	0.29	0.29
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		2.5	2.5		3.0	2.5		3.0	2.5	2.5
Lane Grp Cap (vph)	187	1010		472	991		28	968		57	1026	459
v/s Ratio Prot		0.20			c0.41		0.01	c0.06		c0.02	c0.07	
v/s Ratio Perm	0.05			0.02								0.02
v/c Ratio	0.10	0.38		0.03	0.76		0.54	0.23		0.75	0.24	0.08
Uniform Delay, d1	11.0	13.1		10.6	17.7		48.8	28.2		48.0	27.1	25.8
Progression Factor	1.36	1.31		0.45	0.46		0.69	1.02		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.7		0.1	4.0		17.4	0.1		42.7	0.6	0.3
Delay (s)	15.6	17.8		4.8	12.1		51.0	28.8		90.7	27.7	26.1
Level of Service	B	B		A	B		D	C		F	C	C
Approach Delay (s)		17.7			11.9			30.1			33.8	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet  
2: Valley Pkwy & Broadway

12/20/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	38	646	13	14	623	70	32	303	5	40	195	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00		1.00	0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1857		1770	1835		1770	3531		1770	3539	1583
Flt Permitted	0.22	1.00		0.24	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	411	1857		454	1835		1770	3531		1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	702	14	15	677	76	35	329	5	43	212	89
RTOR Reduction (vph)	0	0	0	0	3	0	0	1	0	0	0	67
Lane Group Flow (vph)	41	716	0	15	750	0	35	333	0	43	212	22
Turn Type	Perm	Perm		Perm	Perm		Prot	Prot		Prot	Perm	Perm
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6								4
Actuated Green, G (s)	71.4	71.4		71.4	71.4		3.6	28.0		5.6	30.0	30.0
Effective Green, g (s)	71.4	71.4		71.4	71.4		3.6	28.0		5.6	30.0	30.0
Actuated g/C Ratio	0.60	0.60		0.60	0.60		0.03	0.23		0.05	0.25	0.25
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		2.5	2.5		3.0	2.5		3.0	2.5	2.5
Lane Grp Cap (vph)	245	1105		270	1092		53	824		83	885	396
v/s Ratio Prot		0.39			c0.41		0.02	c0.09		c0.02	0.06	
v/s Ratio Perm	0.10			0.03								0.01
v/c Ratio	0.17	0.65		0.06	0.69		0.66	0.40		0.52	0.24	0.06
Uniform Delay, d1	10.9	16.0		10.2	16.6		57.6	38.9		55.9	35.9	34.2
Progression Factor	0.86	0.71		0.53	0.42		0.59	0.62		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.9		0.3	2.3		24.2	0.2		5.4	0.6	0.3
Delay (s)	9.9	12.3		5.7	9.4		58.3	24.5		61.3	36.5	34.5
Level of Service	A	B		A	A		E	C		E	D	C
Approach Delay (s)		12.1			9.3			27.7			39.1	
Approach LOS		B			A			C			D	

Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet

3: Valley Pkwy & Juniper St

12/20/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	18	327	12	10	700	33	13	106	4	41	217	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1853		1770	1850		1770	1853		1770	1813	
Flt Permitted	0.22	1.00		0.50	1.00		0.39	1.00		0.68	1.00	
Satd. Flow (perm)	416	1853		938	1850		731	1853		1260	1813	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	355	13	11	761	36	14	115	4	45	236	51
RTOR Reduction (vph)	0	1	0	0	2	0	0	1	0	0	8	0
Lane Group Flow (vph)	20	367	0	11	795	0	14	118	0	45	279	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	2		6		6		8		8		4	
Permitted Phases	2		6		6		8		8		4	
Actuated Green, G (s)	63.0	63.0		63.0	63.0		27.0	27.0		27.0	27.0	
Effective Green, g (s)	63.0	63.0		63.0	63.0		27.0	27.0		27.0	27.0	
Actuated g/C Ratio	0.63	0.63		0.63	0.63		0.27	0.27		0.27	0.27	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	262	1167		591	1166		197	500		340	490	
v/s Ratio Prot		0.20			c0.43			0.06			c0.15	
v/s Ratio Perm	0.05			0.01			0.02			0.04		
v/c Ratio	0.08	0.31		0.02	0.68		0.07	0.24		0.13	0.57	
Uniform Delay, d1	7.2	8.5		6.9	12.0		27.2	28.5		27.6	31.5	
Progression Factor	0.69	0.66		1.00	1.00		1.65	1.67		1.00	1.00	
Incremental Delay, d2	0.5	0.7		0.1	3.2		0.7	1.1		0.2	1.5	
Delay (s)	5.5	6.3		7.0	15.2		45.5	48.5		27.8	33.0	
Level of Service	A		A		B		D		D		C	
Approach Delay (s)	6.3				15.1		48.2				32.3	
Approach LOS	A				B		D				C	

Intersection Summary			
HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet

3: Valley Pkwy & Juniper St

12/20/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	39	619	19	11	738	77	30	55	7	70	263	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1854		1770	1836		1770	1830		1770	1807	
Flt Permitted	0.16	1.00		0.28	1.00		0.30	1.00		0.71	1.00	
Satd. Flow (perm)	303	1854		516	1836		553	1830		1328	1807	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	673	21	12	802	84	33	60	8	76	286	71
RTOR Reduction (vph)	0	1	0	0	3	0	0	4	0	0	8	0
Lane Group Flow (vph)	42	693	0	12	883	0	33	64	0	76	349	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	2		6		6		8		8		4	
Permitted Phases	2		6		6		8		8		4	
Actuated Green, G (s)	75.0	75.0		75.0	75.0		35.0	35.0		35.0	35.0	
Effective Green, g (s)	75.0	75.0		75.0	75.0		35.0	35.0		35.0	35.0	
Actuated g/C Ratio	0.62	0.62		0.62	0.62		0.29	0.29		0.29	0.29	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	189	1159		323	1148		161	534		387	527	
v/s Ratio Prot		0.37			c0.48			0.03			c0.19	
v/s Ratio Perm	0.14			0.02			0.06			0.06		
v/c Ratio	0.22	0.60		0.04	0.77		0.20	0.12		0.20	0.66	
Uniform Delay, d1	9.8	13.5		8.6	16.2		32.0	31.2		31.9	37.3	
Progression Factor	1.17	1.09		1.00	1.00		1.39	1.46		1.00	1.00	
Incremental Delay, d2	2.1	1.8		0.2	5.0		2.7	0.4		0.2	3.1	
Delay (s)	13.6	16.4		8.9	21.2		47.3	45.8		32.2	40.4	
Level of Service	B		B		A		C		D		C	
Approach Delay (s)	16.3				21.1		46.3				39.0	
Approach LOS	B				C		D				D	

Intersection Summary			
HCM Average Control Delay	24.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet  
4: Second Ave & Escondido Blvd

12/20/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Volume (vph)	31	481	27	38	597	44	28	347	65	275	570	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	0.99		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1848		1770	1844		1770	3455		1770	3492	
Flt Permitted	0.13	1.00		0.25	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	235	1848		473	1844		1770	3455		1770	3492	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	523	29	41	649	48	30	377	71	299	620	60
RTOR Reduction (vph)	0	2	0	0	3	0	0	17	0	0	8	0
Lane Group Flow (vph)	34	550	0	41	694	0	30	431	0	299	672	0
Turn Type	Perm		Perm			Prot			Prot			
Protected Phases	2		6			3			8			4
Permitted Phases	2		6			3			8			4
Actuated Green, G (s)	44.2	44.2		44.2	44.2		5.5	16.9		23.9	35.3	
Effective Green, g (s)	44.2	44.2		44.2	44.2		5.5	16.9		23.9	35.3	
Actuated g/C Ratio	0.44	0.44		0.44	0.44		0.06	0.17		0.24	0.35	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	2.0	2.0		3.0	3.0		3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)	104	817		209	815		97	584		423	1233	
v/s Ratio Prot		0.30			c0.38		0.02	c0.12		c0.17	0.19	
v/s Ratio Perm	0.14			0.09								
v/c Ratio	0.33	0.67		0.20	0.85		0.31	0.74		0.71	0.55	
Uniform Delay, d1	18.2	22.2		17.0	25.0		45.4	39.5		34.8	25.9	
Progression Factor	1.00	1.00		0.72	0.78		1.00	1.00		0.73	0.59	
Incremental Delay, d2	8.2	4.4		1.8	9.5		1.8	4.2		5.2	0.3	
Delay (s)	26.4	26.6		14.1	28.9		47.2	43.7		30.6	15.7	
Level of Service	C			B			D			C		
Approach Delay (s)	26.6			28.1			43.9			20.2		
Approach LOS	C			C			D			C		

Intersection Summary			
HCM Average Control Delay	27.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet  
4: Second Ave & Escondido Blvd

12/20/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Volume (vph)	106	722	53	64	627	118	38	440	108	248	592	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	0.98		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1844		1770	1819		1770	3435		1770	3465	
Flt Permitted	0.12	1.00		0.10	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	227	1844		184	1819		1770	3435		1770	3465	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	115	785	58	70	682	128	41	478	117	270	643	104
RTOR Reduction (vph)	0	2	0	0	6	0	0	18	0	0	10	0
Lane Group Flow (vph)	115	841	0	70	804	0	41	577	0	270	737	0
Turn Type	Perm		Perm			Prot			Prot			
Protected Phases	2		6			3			8			4
Permitted Phases	2		6			3			8			4
Actuated Green, G (s)	63.0	63.0		63.0	63.0		4.8	22.2		19.8	37.2	
Effective Green, g (s)	63.0	63.0		63.0	63.0		4.8	22.2		19.8	37.2	
Actuated g/C Ratio	0.52	0.52		0.52	0.52		0.04	0.18		0.17	0.31	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	2.0	2.0		3.0	3.0		3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)	119	968		97	955		71	635		292	1074	
v/s Ratio Prot		0.46			0.44		0.02	c0.17		c0.15	0.21	
v/s Ratio Perm	c0.51			0.38								
v/c Ratio	0.97	0.87		0.72	0.84		0.58	0.91		0.92	0.69	
Uniform Delay, d1	27.5	24.9		21.8	24.3		56.6	47.9		49.4	36.3	
Progression Factor	1.00	1.00		0.87	0.84		1.00	1.00		0.72	0.68	
Incremental Delay, d2	73.9	10.4		33.9	8.1		10.9	16.5		31.9	1.4	
Delay (s)	101.4	35.3		52.9	28.5		67.5	64.4		67.4	26.0	
Level of Service	F			D			E			C		
Approach Delay (s)	43.2			30.5			64.6			37.0		
Approach LOS	D			C			E			D		

Intersection Summary			
HCM Average Control Delay	42.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet

5: Second Ave & Broadway

12/20/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	↔
Volume (vph)	18	342	8	12	592	102	13	104	3	40	100	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.98		1.00	1.00		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1856		1770	1822		1770	1856		1770	1718	
Flt Permitted	0.31	1.00		0.52	1.00		0.32	1.00		0.64	1.00	
Satd. Flow (perm)	585	1856		976	1822		588	1856		1198	1718	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	372	9	13	643	111	14	113	3	43	109	118
RTOR Reduction (vph)	0	0	0	0	4	0	0	1	0	0	44	0
Lane Group Flow (vph)	20	381	0	13	750	0	14	115	0	43	183	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	2		6		6		8		8		4	
Permitted Phases	2		6		6		8		8		4	
Actuated Green, G (s)	75.1	75.1		75.1	75.1		14.9	14.9		14.9	14.9	
Effective Green, g (s)	75.1	75.1		75.1	75.1		14.9	14.9		14.9	14.9	
Actuated g/C Ratio	0.75	0.75		0.75	0.75		0.15	0.15		0.15	0.15	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	439	1394		733	1368		88	277		179	256	
v/s Ratio Prot	0.20		c0.41		c0.41		0.06		0.06		c0.11	
v/s Ratio Perm	0.03		0.01		0.02		0.02		0.04		0.04	
v/c Ratio	0.05	0.27		0.02	0.55		0.16	0.42		0.24	0.71	
Uniform Delay, d1	3.2	3.9		3.1	5.3		37.1	38.6		37.6	40.5	
Progression Factor	1.16	0.96		0.71	0.52		1.00	1.00		0.38	0.33	
Incremental Delay, d2	0.1	0.4		0.0	1.3		0.3	0.4		0.3	7.5	
Delay (s)	3.9	4.1		2.3	4.0		37.4	39.0		14.6	21.0	
Level of Service	A		A		A		D		D		C	
Approach Delay (s)	4.1		4.0		38.8		20.0		20.0		18.8	
Approach LOS	A		A		D		C		C		B	

Intersection Summary			
HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet

5: Second Ave & Broadway

12/20/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	↔
Volume (vph)	38	646	13	14	624	70	32	232	5	40	100	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.98		1.00	1.00		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1857		1770	1835		1770	1857		1770	1737	
Flt Permitted	0.31	1.00		0.32	1.00		0.42	1.00		0.27	1.00	
Satd. Flow (perm)	569	1857		605	1835		773	1857		506	1737	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	702	14	15	678	76	35	252	5	43	109	89
RTOR Reduction (vph)	0	1	0	0	3	0	0	1	0	0	27	0
Lane Group Flow (vph)	41	715	0	15	751	0	35	256	0	43	171	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	2		6		6		8		8		4	
Permitted Phases	2		6		6		8		8		4	
Actuated Green, G (s)	89.0	89.0		89.0	89.0		21.0	21.0		21.0	21.0	
Effective Green, g (s)	89.0	89.0		89.0	89.0		21.0	21.0		21.0	21.0	
Actuated g/C Ratio	0.74	0.74		0.74	0.74		0.18	0.18		0.18	0.18	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	422	1377		449	1361		135	325		89	304	
v/s Ratio Prot	0.39		c0.41		c0.41		c0.14		c0.14		0.10	
v/s Ratio Perm	0.07		0.02		0.05		0.05		0.08		0.08	
v/c Ratio	0.10	0.52		0.03	0.55		0.26	0.79		0.48	0.56	
Uniform Delay, d1	4.3	6.5		4.1	6.8		42.8	47.4		44.6	45.3	
Progression Factor	0.45	0.39		0.83	0.68		1.00	1.00		0.38	0.39	
Incremental Delay, d2	0.2	0.6		0.1	1.3		0.4	11.1		1.5	1.4	
Delay (s)	2.1	3.1		3.5	5.9		43.2	58.5		18.4	18.9	
Level of Service	A		A		A		D		E		B	
Approach Delay (s)	3.1		5.9		56.6		18.8		18.8		18.8	
Approach LOS	A		A		E		B		B		B	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet

6: 2nd Ave & Juniper St

12/20/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Volume (vph)	19	328	11	9	701	34	12	89	5	41	139	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1854		1770	1850		1770	1849		1770	1792	
Flt Permitted	0.29	1.00		0.53	1.00		0.40	1.00		0.69	1.00	
Satd. Flow (perm)	537	1854		987	1850		748	1849		1282	1792	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	357	12	10	762	37	13	97	5	45	151	51
RTOR Reduction (vph)	0	1	0	0	2	0	0	2	0	0	13	0
Lane Group Flow (vph)	21	368	0	10	797	0	13	100	0	45	189	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	2		6		6		8		8		4	
Permitted Phases	2		6		6		8		8		4	
Actuated Green, G (s)	74.4	74.4		74.4	74.4		15.6	15.6		15.6	15.6	
Effective Green, g (s)	74.4	74.4		74.4	74.4		15.6	15.6		15.6	15.6	
Actuated g/C Ratio	0.74	0.74		0.74	0.74		0.16	0.16		0.16	0.16	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	400	1379		734	1376		117	288		200	280	
v/s Ratio Prot		0.20			c0.43			0.05			c0.11	
v/s Ratio Perm	0.04			0.01			0.02			0.04		
v/c Ratio	0.05	0.27		0.01	0.58		0.11	0.35		0.23	0.68	
Uniform Delay, d1	3.4	4.1		3.3	5.8		36.2	37.7		36.9	39.8	
Progression Factor	0.97	1.09		1.00	1.00		1.00	1.00		0.30	0.26	
Incremental Delay, d2	0.2	0.5		0.0	1.8		0.4	0.7		0.5	5.4	
Delay (s)	3.5	4.9		3.3	7.5		36.7	38.4		11.5	15.7	
Level of Service	A	A		A	A		D	D		B	B	
Approach Delay (s)	4.8		7.5		38.2		14.9		14.9		19.3	
Approach LOS	A		A		D		B		B		B	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Escondido GP Update - Two-Way Couplet

6: 2nd Ave & Juniper St

12/20/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Volume (vph)	40	620	19	11	738	76	29	86	7	40	139	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.99		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1854		1770	1837		1770	1841		1770	1771	
Flt Permitted	0.25	1.00		0.34	1.00		0.32	1.00		0.66	1.00	
Satd. Flow (perm)	465	1854		637	1837		588	1841		1222	1771	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	674	21	12	802	83	32	93	8	43	151	74
RTOR Reduction (vph)	0	1	0	0	2	0	0	3	0	0	16	0
Lane Group Flow (vph)	43	694	0	12	883	0	32	98	0	43	209	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	2		6		6		8		8		4	
Permitted Phases	2		6		6		8		8		4	
Actuated Green, G (s)	90.8	90.8		90.8	90.8		19.2	19.2		19.2	19.2	
Effective Green, g (s)	90.8	90.8		90.8	90.8		19.2	19.2		19.2	19.2	
Actuated g/C Ratio	0.76	0.76		0.76	0.76		0.16	0.16		0.16	0.16	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	352	1403		482	1390		94	295		196	283	
v/s Ratio Prot		0.37			c0.48			0.05			c0.12	
v/s Ratio Perm	0.09			0.02			0.05			0.04		
v/c Ratio	0.12	0.49		0.02	0.63		0.34	0.33		0.22	0.74	
Uniform Delay, d1	3.9	5.7		3.6	6.8		44.8	44.7		43.9	48.0	
Progression Factor	0.74	0.55		1.00	1.00		1.00	1.00		0.29	0.27	
Incremental Delay, d2	0.6	1.1		0.1	2.2		2.2	0.7		0.4	7.5	
Delay (s)	3.5	4.2		3.7	9.1		46.9	45.4		13.3	20.4	
Level of Service	A	A		A	A		D	D		B	C	
Approach Delay (s)	4.2		9.0		45.8		19.3		19.3		19.3	
Approach LOS	A		A		D		B		B		B	

Intersection Summary			
HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			