



TETRA TECH EC, INC.

## DOCKET

11-AFC-3

DATE MAR 08 2012

RECD. MAR 08 2012

March 8, 2012

Mr. Eric Solorio  
California Energy Commission  
Docket No. 11-AFC-3  
1516 9<sup>th</sup> St.  
Sacramento, CA 95814

### **Cogentrix Quail Brush Generation Project - Docket Number 11-AFC-3, Response to Questions on Quail Brush Traffic Study**

Docket Clerk:

Pursuant to the provisions of Title 20, California Code of Regulation, and on behalf of Quail Brush Genco, LLC, a wholly owned subsidiary of Cogentrix Energy, LLC, Tetra Tech hereby submits the memo titled *Response to Questions on Quail Brush Traffic Study for the Quail Brush Generation Project*. The Quail Brush Generation Project is a 100 megawatt natural gas fired electric generation peaking facility to be located in the City of San Diego, California.

This memo was prepared in response to questions posed by CEC staff during a technical conference call on February 14, 2012, and provides additional information for the following issue area:

- Traffic and Transportation

If you have any questions regarding this submittal, please contact Rick Neff at (704) 525-3800 or me at (303) 980.3653.

Sincerely,

Constance E. Farmer  
Project Manager/Tetra Tech

cc: Lori Ziebart, Cogentrix  
John Collins, Cogentrix  
Rick Neff, Cogentrix

TETRA TECH EC, INC.

# MEMORANDUM

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To: Sarah McCall  
Tetra Tech

Date: March 2, 2012

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From: John Boarman, P.E.  
LLG, Engineers

LLG Ref: 3-11-2075

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Subject: Response to Questions on Quail Brush Traffic Study

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Q1. On Figure 7-2, does the 7% in the middle just above Highway 52 and Mission Gorge Road refer to Mission Gorge Road? If so, then the traffic impacts on Mission Gorge Road need to be analyzed.

**Response: The 7% refers to Highway 52. Mission Gorge Road does not need to be analyzed since less than 1% of employee traffic is expected to use Mission Gorge Road.**

Q2. On Figure 7-2, what does the 1% Local Capture mean or signify?

**Response: The 1% Local Capture refers to the percentage of employees that are local residents living just south of Mission Gorge Road.**

Q3. Because of the new tie in at the existing substation, please analyze traffic impacts on neighborhood roads including Mast Blvd, Fantina and Medina.

**Response: This comment is addressed in the attached March 2, 2012 memo.**

cc: File

LINSCOTT  
LAW &  
GREENSPAN

engineers

## Engineers & Planners

Traffic  
Transportation  
Parking

## Linscott, Law & Greenspan, Engineers

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Suite 100  
San Diego, CA 92111

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858.300.8810 F

[www.llgengineers.com](http://www.llgengineers.com)

Pasadena  
Costa Mesa  
San Diego  
Las Vegas

# MEMORANDUM

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To:	Sarah McCall Tetra Tech	Date:	March 2, 2012
From:	John Boarman, P.E. LLG, Engineers	LLG Ref:	3-11-2075
Subject:	Quail Brush Traffic Study Addendum		

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## INTRODUCTION

Linscott, Law & Greenspan, Engineers (LLG) completed a traffic study for the Quail Brush Generation Project dated January 19, 2012. Subsequent to the completion of that study, a change to the generation tie line (gen tie) for the Quail Brush Generation Project was proposed. The original planned Point of Interconnection (POI) was to the existing San Diego Gas & Electric (SDG&E) Miguel to Mission 230kV transmission line. The newly proposed POI is to the existing SDG&E Carlton Hills Substation. This proposed change requires the construction of three gen tie poles near the Carlton Hills Substation and modification of the SDG&E Carlton Hills Substation. The overall amount of traffic for the construction of the Quail Brush Generation Project is expected to stay the same. However, this change will result in additional traffic accessing the construction area via Medina Drive. The construction of the three gen tie poles will take about three months to complete.

Included in this memorandum are the following:

- Existing Conditions Description;
- Project Trip Generation;
- Analysis of Existing Conditions;
- Analysis of Existing+Construction Scenario.

## EXISTING CONDITIONS

The following intersections and street segments were analyzed in the study:

- Mast Boulevard / Medina Drive intersection
- Mast Boulevard / West Hills High School Driveway intersection
- Mast Boulevard from West Hills Parkway to Fanita Parkway
- Medina Drive north of Mast Boulevard

**Figure 1** shows the location of the project area.

### Existing Street Network

The principal roadways in the project study area are described briefly below. The description includes the physical characteristics and adjacent land uses.

LINSCOTT  
LAW &  
GREENSPAN

engineers

**Engineers & Planners**  
Traffic  
Transportation  
Parking

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San Diego  
Las Vegas

**Mast Boulevard** is classified as a Major Road. It is a four-lane roadway that is constructed between SR 52 and Los Ranchitos Road near the eastern Santee city limits. Currently, it is constructed as a four-lane divided roadway in the project vicinity. Bike lanes are provided and street parking is prohibited. The posted speed limit is 40 mph (25 mph in school zone).

**Medina Drive** is an unclassified residential roadway currently constructed as a two-lane undivided roadway in the project vicinity. Street parking is generally allowed and the posted speed limit is 25 mph. Medina Drive provides access to the Carlton Hills Substation via Pecan Valley Drive.

#### Existing Traffic Volumes

The peak hour intersection turning movement counts were conducted in February 2012. Average daily traffic (ADT) counts were conducted in April 2011 and February 2012. **Attachment 1** contains the manual count sheets.

#### ANALYSIS OF EXISTING CONDITIONS

**Table 1** summarizes the existing peak hour intersection operations. As seen in **Table 1**, both study-area intersections are calculated to currently operate at LOS D or better. **Attachment 2** contains the existing peak hour intersection analysis worksheets.

**Table 2** and **Table 3** summarize the existing daily street segment operations. As seen in **Table 2**, Mast Boulevard from West Hills Parkway to Fanita Parkway is calculated to currently operate at LOS B. As seen in **Table 3**, Medina Drive north of Mast Boulevard is calculated to currently operate within its functional capacity.

TABLE 1  
EXISTING INTERSECTION OPERATIONS

Intersection	Control Type	Peak Hour	Existing	
			Delay <sup>a</sup>	LOS <sup>b</sup>
1. Mast Boulevard / Medina Drive	Signal	AM PM	26.4 12.7	C B
2. Mast Boulevard / West Hills High School Driveway	TWSC <sup>c</sup>	AM PM	13.2 31.2	B D

**Footnotes:**

- a. Average delay expressed in seconds per vehicle.
- b. LOS = Level of Service. See table at right for delay thresholds.
- c. TWSC = Two-Way Stop Controlled intersection. Minor street left turn delay is reported

SIGNALIZED		UNSIGNALIZED	
DELAY/LOS THRESHOLDS		DELAY/LOS THRESHOLDS	
Delay	LOS	Delay	LOS
0.0 < 10.0	A	0.0 < 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
> 80.1	F	> 50.1	F

TABLE 2  
EXISTING MAST BOULEVARD LOS OPERATIONS

Street Segment	Existing Capacity (LOS E)	Existing		
		ADT <sup>a</sup>	V/C <sup>b</sup>	LOS <sup>c</sup>
<b>Mast Boulevard</b> West Hills Parkway to Fanita Parkway	40,000	18,580	0.464	B

**Footnotes:**

- a. Average Daily Traffic
- b. Volume to Capacity ratio
- c. Level of Service

TABLE 3  
EXISTING MEDINA DRIVE FUNCTIONAL CAPACITY CALCULATION

Street Segment	Functional Capacity <sup>a</sup>	Existing	
		ADT <sup>b</sup>	Within Functional Capacity?
<b>Medina Drive</b> North of Mast Boulevard	2,200	1,830	Yes

**Footnotes:**

- a. Functional Capacities based on *City of San Diego Traffic Impact Study Manual*.
- b. Average Daily Traffic

## PROJECT TRIP GENERATION

The overall number of trips related to the construction of the Quail Brush Generation Project is not expected to change. However, the revised gen tie construction will require access to the Carlton Hills Substation via Medina Drive. The gen tie construction which is the subject of this addendum is estimated to generate a total of 24 heavy truck trips. In order to be conservative, 12 heavy truck trips were assumed to occur in a single day. In addition, 6 daily construction worker trips were assumed and each worker was assumed to drive solo. These roundtrips were multiplied by two to account for one-way incoming and one-way outgoing trips. The heavy trucks and construction workers are expected to use the SR 52 / Mast Boulevard interchange and therefore access Medina Drive from the west.

A Passenger Car Equivalent (PCE) factor was applied to the generated truck trips in the analysis. PCE is defined as the number of passenger cars that are displaced by a single heavy vehicle of a particular type under the prevailing traffic conditions. Heavy vehicles have a greater traffic impact than passenger cars since: (1) they are larger than passenger cars, and therefore, occupy more roadway space; and (2) their performance characteristics are generally inferior to passenger cars, leading to the formation of downstream gaps in the traffic stream (especially on upgrades) which cannot always be effectively filled by normal passing maneuvers. Based on the elevation changes in the vicinity of the project site a PCE of 2.0 was applied to each truck trip.

A Vehicle Occupancy Rate (VOR) of 1.0 was applied to the construction worker trips in the analysis. This assumes that there is no carpooling and that each construction worker is driving a separate vehicle. A VOR of 1.0 was utilized because it represents the worst-case scenario. The workers will not park on the street. Instead, they will park on SDG&E property accessed via Medina Dr.

**Table 4** summarizes the trip generation for the peak construction phase for truck and construction crew traffic. This table states that the worst case trip generation is 60 ADT with 16 trips during the AM peak hour (16 entering and 0 exiting) and 16 trips during the PM peak hour (0 entering and 16 exiting).

TABLE 4  
CONSTRUCTION TRAFFIC TRIP GENERATION

Trip Generation Summary (Truck/Equipment only)								
Vehicle Type	Trucks Trips	Total ADT in PCE <sup>a</sup>	AM Peak Hour			PM Peak Hour		
			% Of ADT	Volume		% OF ADT	Volume	
				In	Out		In	Out
Heavy Trucks	24 <sup>b</sup>	48	20%	10	0	20%	0	10
Trip Generation Summary (Crew Vehicles Only)								
Vehicle Type	Crew Vehicle Trips	Total ADT in PCE	AM Peak Hour			PM Peak Hour		
			% Of ADT	Volume		% OF ADT	Volume	
				In	Out		In	Out
Construction Workers	12 <sup>c</sup>	12	50%	6	0	50%	0	6
Trip Generation Summary (Total)								
Vehicle Type	Total Vehicle Trips	Total ADT in PCE	AM Peak Hour			PM Peak Hour		
				Volume			Volume	
				In	Out		In	Out
<b>Total</b>	36	60		16	0		0	16

**Footnotes:**

- a. PCE = Passenger Car Equivalents.
- b. 12 in / 12 out
- c. 6 in / 6 out

## ANALYSIS OF EXISTING+CONSTRUCTION SCENARIO

**Table 5** summarizes the existing+construction peak hour intersection operations. As seen in *Table 5*, both study-area intersections are calculated to operate at LOS D or better with the addition of construction traffic. **Attachment 3** contains the existing+construction peak hour intersection analysis worksheets.

**Table 6** and **Table 7** summarize the existing+construction daily street segment operations. As seen in *Table 6*, Mast Boulevard from West Hills Parkway to Fanita Parkway is calculated to operate at LOS B with the addition of construction traffic. As seen in *Table 7*, Medina Drive north of Mast Boulevard is calculated to operate within functional capacity with the addition of construction traffic.

TABLE 5  
EXISTING+CONSTRUCTION INTERSECTION OPERATIONS

Intersection	Control Type	Peak Hour	Existing		Existing + Construction		$\Delta^c$
			Delay <sup>a</sup>	LOS <sup>b</sup>	Delay	LOS	
1. Mast Boulevard / Medina Drive	Signal	AM PM	26.4 12.7	C B	28.1 12.7	C B	1.7 0.0
2. Mast Boulevard / West Hills High School Driveway	TWSC <sup>c</sup>	AM PM	13.2 31.2	B D	13.4 31.6	B D	0.2 0.4

**Footnotes:**

- a. Average delay expressed in seconds per vehicle.
- b. Level of Service.
- c.  $\Delta$  denotes the increase in delay due to project.
- d. TWSC – Two-Way Stop Controlled intersection. Minor street left turn delay is reported.

SIGNALIZED		UNSIGNALIZED	
DELAY/LOS THRESHOLDS		DELAY/LOS THRESHOLDS	
Delay	LOS	Delay	LOS
0.0 < 10.0	A	0.0 < 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
> 80.1	F	> 50.1	F

TABLE 6  
EXISTING+CONSTRUCTION MAST BOULEVARD LOS OPERATIONS

Street Segment	Existing Capacity (LOS E)	Existing			Existing + Construction			$\Delta^d$
		ADT <sup>a</sup>	V/C <sup>b</sup>	LOS <sup>c</sup>	ADT	V/C	LOS	
Mast Boulevard West Hills Parkway to Fanita Parkway	40,000	18,580	0.464	B	18,640	0.466	B	0.002

**Footnotes:**

- a. Average Daily Traffic
- b. Volume to Capacity ratio
- c. Level of Service
- d.  $\Delta$  denotes the project-induced increase in the Volume to Capacity ratio



TABLE 7  
EXISTING+CONSTRUCTION MEDINA DRIVE FUNCTIONAL CAPACITY CALCULATION

Street Segment	Functional Capacity <sup>a</sup>	Existing		Existing + Construction	
		ADT <sup>b</sup>	Within Functional Capacity?	ADT	Within Functional Capacity?
Medina Drive North of Mast Boulevard	2,200	1,829	Yes	1,889	Yes

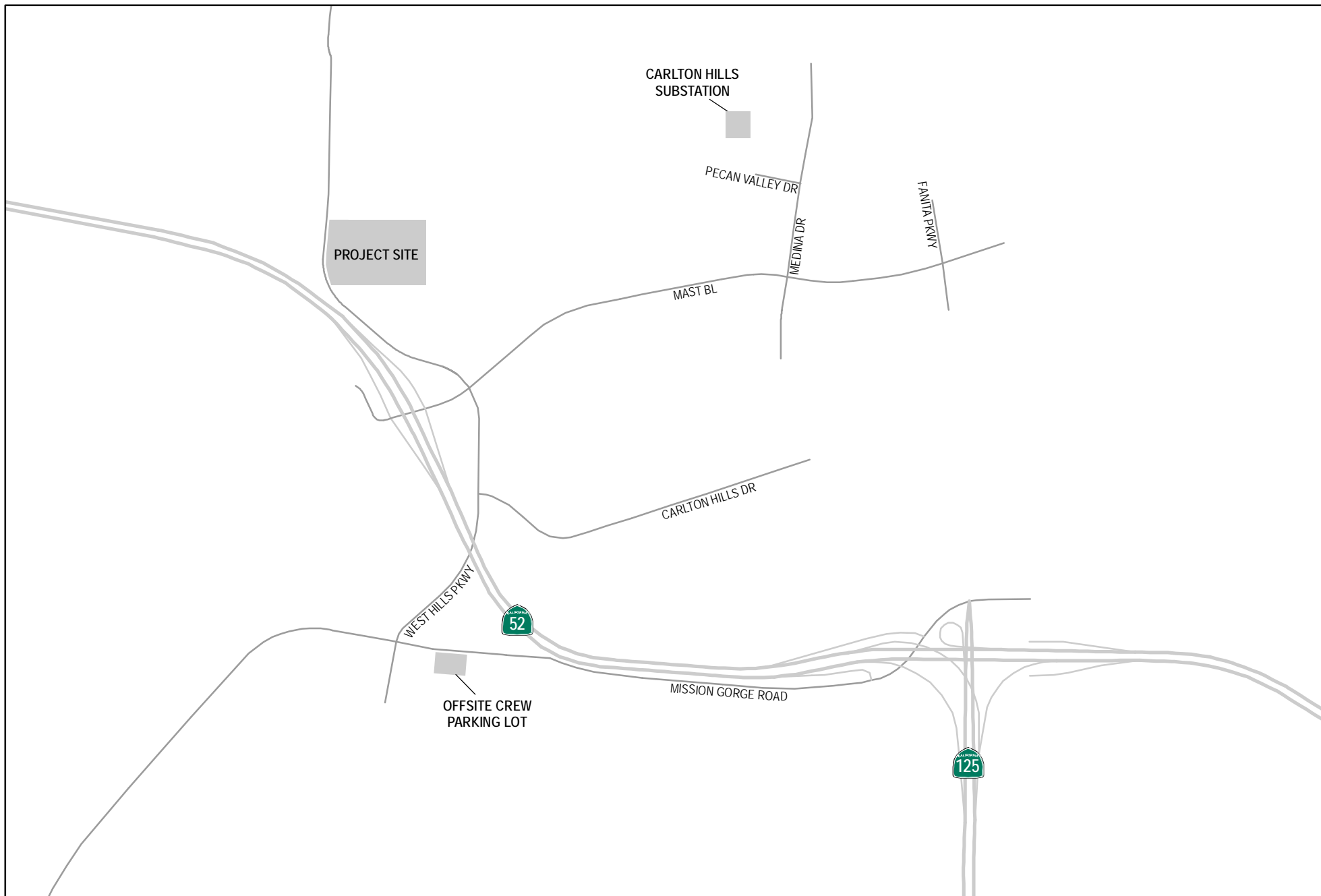
**Footnotes:**

- a. Functional Capacities based on the *City of San Diego Traffic Impact Study Manual*.
- b. Average Daily Traffic

**CONCLUSION**

Based on the analysis of the study intersections and segments, no significant traffic impacts due to the change in the gen tie were determined.

cc: File

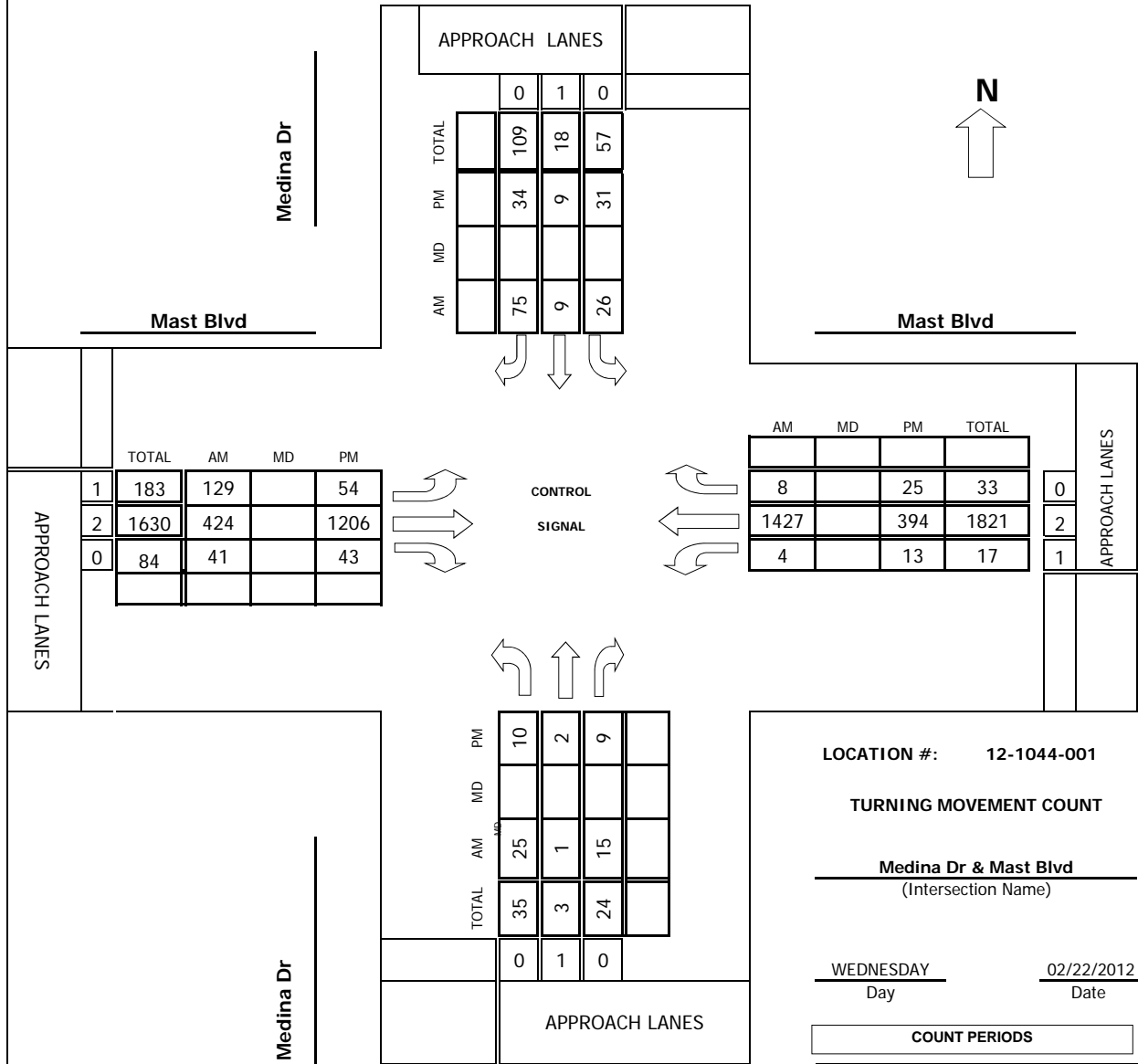


## **ATTACHMENT 1**

### **PEAK HOUR INTERSECTION / DAILY STREET SEGMENT COUNT SHEETS**

**Project #:** 12-1044-001

**TMC SUMMARY OF Medina Dr & Mast Blvd**



**LOCATION #:** 12-1044-001

**TURNING MOVEMENT COUNT**

**Medina Dr & Mast Blvd**  
(Intersection Name)

**WEDNESDAY** 02/22/2012  
Day Date

**COUNT PERIODS**

AM	700AM	-	900AM
NOON		-	
PM	400PM	-	600PM

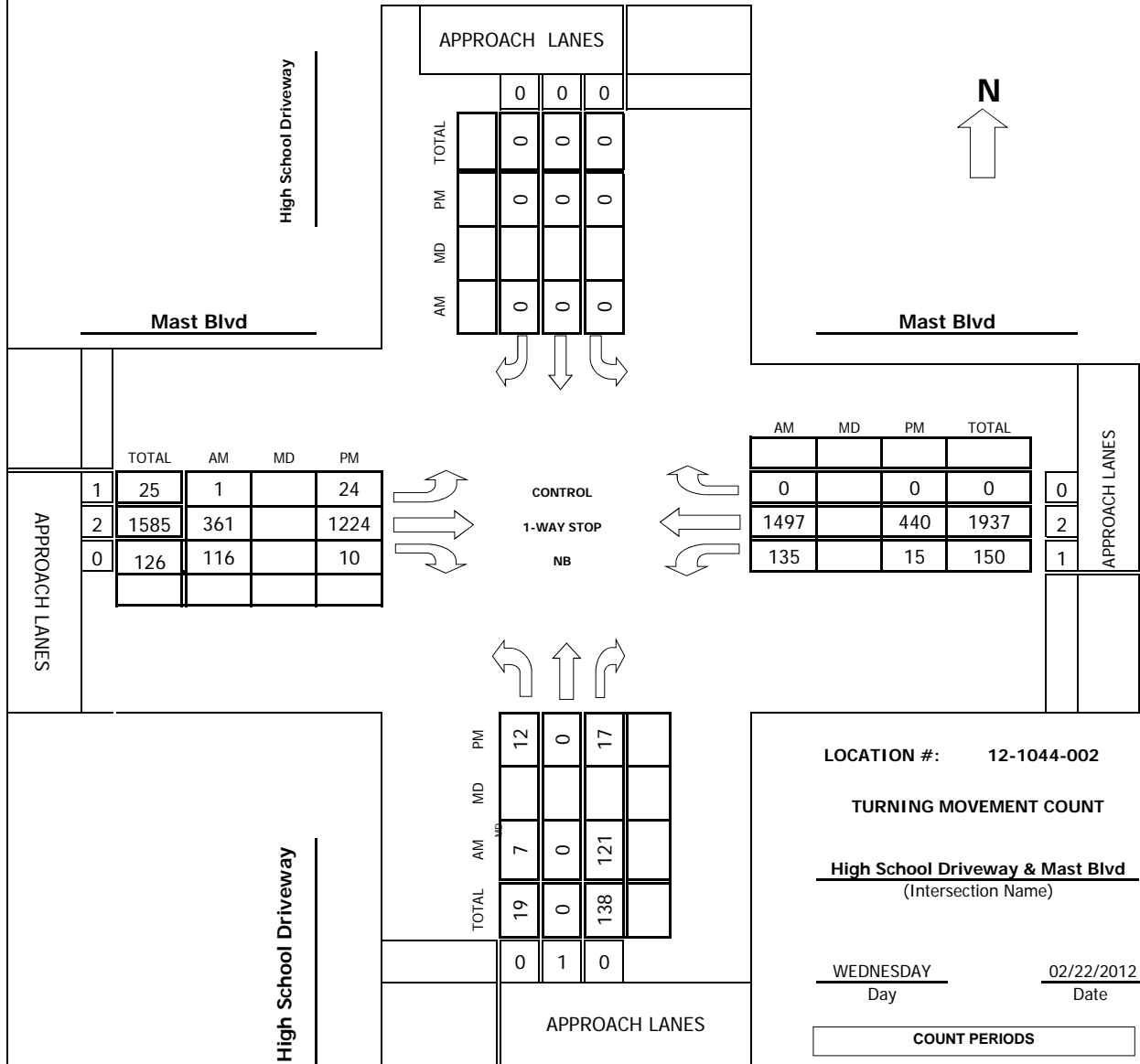
AM PEAK HOUR 715 AM

NOON PEAK HOUR

PM PEAK HOUR 445 PM

**Project #:** 12-1044-002

**TMC SUMMARY OF High School Driveway & Mast Blvd**



AM PEAK HOUR 700 AM

NOON PEAK HOUR

PM PEAK HOUR 445 PM

# Prepared by: Field Data Services of Arizona (520) 316-6745

Volumes for: Wednesday, February 22, 2012

City: Santee

Project #: 12-1044-001

Location: Medina Dr North of Mast Blvd

AM Period	NB	SB	EB	WB	PM Period	NB	SB	EB	WB
00:00	0	0			12:00	18	9		
00:15	0	0			12:15	17	7		
00:30	1	1			12:30	16	7		
00:45	2	3	1	2	12:45	12	63	5	28
01:00	0	0			13:00	17	5		
01:15	0	0			13:15	19	8		
01:30	0	0			13:30	18	10		
01:45	0	0	0	0	13:45	18	72	15	38
02:00	0	0			14:00	13	9		
02:15	2	2			14:15	16	10		
02:30	1	0			14:30	12	10		
02:45	0	3	0	2	14:45	15	56	12	41
03:00	1	2			15:00	12	11		
03:15	0	1			15:15	20	9		
03:30	0	0			15:30	12	11		
03:45	1	2	2	5	15:45	10	54	12	43
04:00	0	0			16:00	17	13		
04:15	1	1			16:15	20	17		
04:30	2	2			16:30	18	16		
04:45	2	5	3	6	16:45	16	71	9	55
05:00	3	8			17:00	17	15		
05:15	5	3			17:15	18	12		
05:30	6	11			17:30	16	11		
05:45	12	26	12	34	17:45	24	75	14	52
06:00	11	17			18:00	27	13		
06:15	9	12			18:15	24	9		
06:30	16	15			18:30	6	19		
06:45	19	55	23	67	18:45	8	65	17	58
07:00	24	33			19:00	6	8		
07:15	25	29			19:15	7	8		
07:30	25	28			19:30	12	5		
07:45	24	98	31	121	19:45	10	35	19	40
08:00	26	28			20:00	12	4		
08:15	27	21			20:15	6	2		
08:30	31	15			20:30	9	4		
08:45	25	109	13	77	20:45	8	35	4	14
09:00	22	12			21:00	6	7		
09:15	18	5			21:15	6	2		
09:30	15	15			21:30	3	2		
09:45	12	67	8	40	21:45	4	19	6	17
10:00	7	7			22:00	2	1		
10:15	15	4			22:15	3	1		
10:30	14	3			22:30	6	0		
10:45	12	48	1	15	22:45	1	12	1	3
11:00	10	6			23:00	0	2		
11:15	16	10			23:15	2	0		
11:30	13	12			23:30	2	0		
11:45	15	54	6	34	23:45	3	7	1	3
<b>Total Vol.</b>	470	403			<b>873</b>	564	392		<b>956</b>
					<b>Daily Totals</b>				
					NB	SB	EB	WB	Combined
					1034	795			1829
<b>AM</b>					<b>PM</b>				
<b>Split %</b>	53.8%	46.2%		<b>47.7%</b>	59.0%	41.0%			<b>52.3%</b>
<b>Peak Hour</b>	08:00	07:00		<b>07:00</b>	17:30	15:45			<b>17:30</b>
<b>Volume</b>	109	121		<b>219</b>	91	58			<b>138</b>
<b>P.H.F.</b>	0.88	0.92		<b>0.96</b>	0.84	0.85			<b>0.86</b>

## MetroCount Traffic Executive Event Counts

780 -- English (ENU)

**Datasets:**

**Site:** [1134.02] MAST BLVD (EAST OF WESTHILLS PKWY) WESTBOUND  
**Input A:** 4 - West bound. - Lane= 0, Added to totals. (/2.000)  
**Input B:** 2 - East bound. - Lane= 0, Excluded from totals.  
**Survey Duration:** 16:44 Wednesday, March 30, 2011 => 11:01 Friday, April 01, 2011  
**File:** 1134.0201Apr2011.EC0 (Regular)  
**Data type:** Axle sensors - Separate (Count)

**Profile:**

**Filter time:** 0:00 Thursday, March 31, 2011 => 0:00 Friday, April 01, 2011  
**In profile:** Events = 18057 / 23573 (76.60%)

\* Thursday, March 31, 2011=9092, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
22	15	14	57	138	487	1016	1337	994	473	361	371	432	404	460	461	407	400	389	302	213	200	92	52	-
10	5	2	9	19	72	195	369	353	141	75	98	108	90	112	138	104	101	86	72	52	64	25	16	-
5	1	2	11	24	112	237	339	237	125	76	91	131	89	102	112	101	106	94	97	52	50	30	9	-
4	6	7	17	34	165	300	329	229	116	110	91	105	79	94	121	112	98	118	66	64	52	20	15	-
3	3	3	20	62	138	285	301	175	92	101	92	90	147	153	91	90	95	92	67	45	35	18	12	-

AM Peak 0700 - 0800 (1337), AM PHP=0.91

## MetroCount Traffic Executive Event Counts

781 - English (ENU)

**Datasets:**

**Site:** [1134.02] MAST BLVD (EAST OF WESTHILLS PKWY) EASTBOUND  
**Input A:** 4 - West bound. - Lane= 0, Excluded from totals.  
**Input B:** 2 - East bound. - Lane= 0, Added to totals. (/2.000)  
**Survey Duration:** 16:44 Wednesday, March 30, 2011 => 11:01 Friday, April 01, 2011  
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**Data type:** Axle sensors - Separate (Count)

**Profile:**

**Filter time:** 0:00 Thursday, March 31, 2011 => 0:00 Friday, April 01, 2011  
**In profile:** Events = 18057 / 23573 (76.60%)

\* Thursday, March 31, 2011=8966, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
71	29	18	15	24	36	252	557	365	239	253	316	377	442	733	952	1050	1094	745	486	362	260	197	99	
19	10	6	6	4	8	21	224	174	75	54	63	80	88	118	212	254	250	225	121	103	78	53	25	-
12	7	2	4	3	6	30	72	57	57	59	78	115	99	161	217	250	304	217	137	97	69	53	33	-
21	6	6	3	6	8	38	106	59	49	63	97	80	120	186	255	269	270	160	120	79	61	40	22	-
19	6	4	2	11	14	163	156	76	59	79	79	102	136	269	268	278	270	143	108	84	54	51	19	-

AM Peak 0645 - 0745 (564), AM PHF=0.63



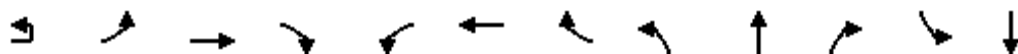
**ATTACHMENT 2**

**EXISTING PEAK HOUR INTERSECTION ANALYSIS  
WORKSHEETS**

# HCM Signalized Intersection Capacity Analysis

## 1: Mast Blvd & Medina Dr

Existing AM  
3/2/2012



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↔	↔		↔	↔			↔			↔
Volume (vph)	65	64	424	41	4	1467	8	25	1	15	26	9
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			4.0			4.0
Lane Util. Factor		1.00	0.95		1.00	0.95			1.00			1.00
Frt		1.00	0.99		1.00	1.00			0.95			0.91
Flt Protected		0.95	1.00		0.95	1.00			0.97			0.99
Satd. Flow (prot)		1770	3492		1770	3536			1719			1671
Flt Permitted		0.95	1.00		0.95	1.00			0.85			0.91
Satd. Flow (perm)		1770	3492		1770	3536			1512			1545
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)	71	70	461	45	4	1595	9	27	1	16	28	10
RTOR Reduction (vph)	0	0	11	0	0	1	0	0	13	0	0	62
Lane Group Flow (vph)	0	141	495	0	4	1603	0	0	31	0	0	58
Turn Type	Prot	Prot			Prot			Perm			Perm	
Protected Phases	7	7	4		3	8			2			6
Permitted Phases								2			6	
Actuated Green, G (s)		4.0	22.5		0.7	19.2			6.9			6.9
Effective Green, g (s)		4.0	22.5		0.7	19.2			6.9			6.9
Actuated g/C Ratio		0.10	0.53		0.02	0.46			0.16			0.16
Clearance Time (s)		4.0	4.0		4.0	4.0			4.0			4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0			3.0			3.0
Lane Grp Cap (vph)		168	1866		29	1613			248			253
v/s Ratio Prot		c0.08	c0.14		0.00	c0.45						
v/s Ratio Perm									0.02			c0.04
v/c Ratio		0.84	0.27		0.14	0.99			0.12			0.23
Uniform Delay, d1		18.7	5.3		20.4	11.4			15.0			15.3
Progression Factor		1.00	1.00		1.00	1.00			1.00			1.00
Incremental Delay, d2		29.1	0.1		2.2	20.9			0.2			0.5
Delay (s)		47.8	5.4		22.6	32.3			15.2			15.8
Level of Service		D	A		C	C			B			B
Approach Delay (s)			14.6			32.2			15.2			15.8
Approach LOS			B			C			B			B

### Intersection Summary

HCM Average Control Delay	26.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	42.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 1: Mast Blvd & Medina Dr

Existing AM  
3/2/2012

Movement	SBR
Lane Configurations	
Volume (vph)	75
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	82
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

# HCM Unsignalized Intersection Capacity Analysis

## 2: Mast Blvd & West Hills High School Dwy

Existing AM  
3/2/2012



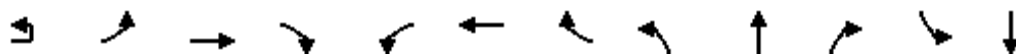
Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations							
Volume (veh/h)	1	461	116	135	1497	7	121
Sign Control		Free			Free	Stop	
Grade		0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	501	126	147	1627	8	132
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None			None			
Median storage (veh)							
Upstream signal (ft)					840		
pX, platoon unblocked	0.00					0.61	
vC, conflicting volume	0			627		1671	314
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	0			627		825	314
tC, single (s)	0.0			4.1		6.8	6.9
tC, 2 stage (s)							
tF (s)	0.0			2.2		3.5	3.3
p0 queue free %	0			85		95	81
cM capacity (veh/h)	0			951		161	682
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	334	293	0	147	814	814	139
Volume Left	0	0	0	147	0	0	8
Volume Right	0	126	0	0	0	0	132
cSH	1700	1700	1700	951	1700	1700	579
Volume to Capacity	0.20	0.17	0.00	0.15	0.48	0.48	0.24
Queue Length 95th (ft)	0	0	0	14	0	0	23
Control Delay (s)	0.0	0.0	0.0	9.5	0.0	0.0	13.2
Lane LOS				A			B
Approach Delay (s)	0.0			0.8			13.2
Approach LOS							B
Intersection Summary							
Average Delay			1.3				
Intersection Capacity Utilization			62.6%		ICU Level of Service		B
Analysis Period (min)			15				

# HCM Signalized Intersection Capacity Analysis

Existing PM

## 1: Mast Blvd & Medina Dr

3/2/2012



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↔	↔		↔	↔			↔			↔
Volume (vph)	17	37	1206	43	13	394	25	10	2	9	31	9
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			4.0			4.0
Lane Util. Factor		1.00	0.95		1.00	0.95			1.00			1.00
Frt		1.00	0.99		1.00	0.99			0.94			0.94
Flt Protected		0.95	1.00		0.95	1.00			0.98			0.98
Satd. Flow (prot)		1770	3521		1770	3508			1712			1712
Flt Permitted		0.95	1.00		0.95	1.00			0.85			0.86
Satd. Flow (perm)		1770	3521		1770	3508			1486			1504
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	40	1311	47	14	428	27	11	2	10	34	10
RTOR Reduction (vph)	0	0	4	0	0	8	0	0	8	0	0	30
Lane Group Flow (vph)	0	58	1354	0	14	447	0	0	15	0	0	51
Turn Type	Prot	Prot			Prot			Perm			Perm	
Protected Phases	7	7	4		3	8			2			6
Permitted Phases								2			6	
Actuated Green, G (s)		1.4	16.9		0.6	16.1			6.7			6.7
Effective Green, g (s)		1.4	16.9		0.6	16.1			6.7			6.7
Actuated g/C Ratio		0.04	0.47		0.02	0.44			0.19			0.19
Clearance Time (s)		4.0	4.0		4.0	4.0			4.0			4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0			3.0			3.0
Lane Grp Cap (vph)		68	1644		29	1560			275			278
v/s Ratio Prot		c0.03	c0.38		0.01	0.13						
v/s Ratio Perm									0.01			c0.03
v/c Ratio		0.85	0.82		0.48	0.29			0.05			0.18
Uniform Delay, d1		17.3	8.4		17.6	6.4			12.1			12.4
Progression Factor		1.00	1.00		1.00	1.00			1.00			1.00
Incremental Delay, d2		60.8	3.5		12.1	0.1			0.1			0.3
Delay (s)		78.1	11.8		29.8	6.5			12.2			12.8
Level of Service		E	B		C	A			B			B
Approach Delay (s)			14.6			7.2			12.2			12.8
Approach LOS			B			A			B			B

### Intersection Summary

HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	36.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 1: Mast Blvd & Medina Dr

Existing PM  
3/2/2012

Movement	SBR
Lane Configurations	
Volume (vph)	34
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	37
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

# HCM Unsignalized Intersection Capacity Analysis

## 2: Mast Blvd & West Hills High School Dwy

Existing PM  
3/2/2012



Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations							
Volume (veh/h)	24	1224	10	15	440	12	17
Sign Control		Free			Free	Stop	
Grade		0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1330	11	16	478	13	18
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None			None		
Median storage (veh)							
Upstream signal (ft)					840		
pX, platoon unblocked	0.00						
vC, conflicting volume	0			1341		1608	671
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	0			1341		1608	671
tC, single (s)	0.0			4.1		6.8	6.9
tC, 2 stage (s)							
tF (s)	0.0			2.2		3.5	3.3
p0 queue free %	0			97		86	95
cM capacity (veh/h)	0			510		93	399
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	887	454	0	16	239	239	32
Volume Left	0	0	0	16	0	0	13
Volume Right	0	11	0	0	0	0	18
cSH	1700	1700	1700	510	1700	1700	168
Volume to Capacity	0.52	0.27	0.00	0.03	0.14	0.14	0.19
Queue Length 95th (ft)	0	0	0	2	0	0	17
Control Delay (s)	0.0	0.0	0.0	12.3	0.0	0.0	31.2
Lane LOS				B			D
Approach Delay (s)	0.0			0.4			31.2
Approach LOS							D
Intersection Summary							
Average Delay			0.6				
Intersection Capacity Utilization			44.2%		ICU Level of Service		A
Analysis Period (min)			15				

## **ATTACHMENT 3**

### **EXISTING + CONSTRUCTION PEAK HOUR INTERSECTION ANALYSIS WORKSHEETS**

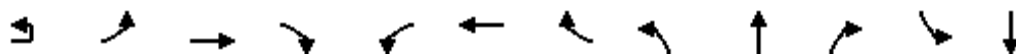


# HCM Signalized Intersection Capacity Analysis

Existing+Construction AM

## 1: Mast Blvd & Medina Dr

3/2/2012



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↔	↔		↔	↔			↔			↔
Volume (vph)	65	80	424	41	4	1467	8	25	1	15	26	9
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			4.0			4.0
Lane Util. Factor		1.00	0.95		1.00	0.95			1.00			1.00
Frt		1.00	0.99		1.00	1.00			0.95			0.91
Flt Protected		0.95	1.00		0.95	1.00			0.97			0.99
Satd. Flow (prot)		1770	3492		1770	3536			1719			1671
Flt Permitted		0.95	1.00		0.95	1.00			0.85			0.91
Satd. Flow (perm)		1770	3492		1770	3536			1512			1545
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)	71	87	461	45	4	1595	9	27	1	16	28	10
RTOR Reduction (vph)	0	0	11	0	0	1	0	0	13	0	0	62
Lane Group Flow (vph)	0	158	495	0	4	1603	0	0	31	0	0	58
Turn Type	Prot	Prot			Prot			Perm			Perm	
Protected Phases	7	7	4		3	8			2			6
Permitted Phases								2			6	
Actuated Green, G (s)		4.0	22.5		0.7	19.2			6.9			6.9
Effective Green, g (s)		4.0	22.5		0.7	19.2			6.9			6.9
Actuated g/C Ratio		0.10	0.53		0.02	0.46			0.16			0.16
Clearance Time (s)		4.0	4.0		4.0	4.0			4.0			4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0			3.0			3.0
Lane Grp Cap (vph)		168	1866		29	1613			248			253
v/s Ratio Prot		c0.09	c0.14		0.00	c0.45						
v/s Ratio Perm									0.02			c0.04
v/c Ratio		0.94	0.27		0.14	0.99			0.12			0.23
Uniform Delay, d1		18.9	5.3		20.4	11.4			15.0			15.3
Progression Factor		1.00	1.00		1.00	1.00			1.00			1.00
Incremental Delay, d2		52.0	0.1		2.2	20.9			0.2			0.5
Delay (s)		70.9	5.4		22.6	32.3			15.2			15.8
Level of Service		E	A		C	C			B			B
Approach Delay (s)			21.0			32.2			15.2			15.8
Approach LOS			C			C			B			B

### Intersection Summary

HCM Average Control Delay	28.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	42.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 1: Mast Blvd & Medina Dr

Existing+Construction AM

3/2/2012

Movement	SBR
Lane Configurations	
Volume (vph)	75
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	82
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

# HCM Unsignalized Intersection Capacity Analysis

## 2: Mast Blvd & West Hills High School Dwy

Existing+Construction AM

3/2/2012



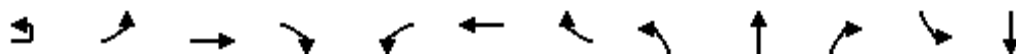
Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations							
Volume (veh/h)	1	477	116	135	1497	7	121
Sign Control		Free			Free	Stop	
Grade		0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	518	126	147	1627	8	132
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None			None		
Median storage (veh)							
Upstream signal (ft)					840		
pX, platoon unblocked	0.00					0.61	
vC, conflicting volume	0			645		1689	322
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	0			645		854	322
tC, single (s)	0.0			4.1		6.8	6.9
tC, 2 stage (s)							
tF (s)	0.0			2.2		3.5	3.3
p0 queue free %	0			84		95	80
cM capacity (veh/h)	0			936		153	673
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	346	299	0	147	814	814	139
Volume Left	0	0	0	147	0	0	8
Volume Right	0	126	0	0	0	0	132
cSH	1700	1700	1700	936	1700	1700	568
Volume to Capacity	0.20	0.18	0.00	0.16	0.48	0.48	0.24
Queue Length 95th (ft)	0	0	0	14	0	0	24
Control Delay (s)	0.0	0.0	0.0	9.6	0.0	0.0	13.4
Lane LOS				A			B
Approach Delay (s)	0.0			0.8			13.4
Approach LOS							B
Intersection Summary							
Average Delay			1.3				
Intersection Capacity Utilization			62.6%		ICU Level of Service		B
Analysis Period (min)			15				

# HCM Signalized Intersection Capacity Analysis

Existing+Construction PM

## 1: Mast Blvd & Medina Dr

3/2/2012



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↔	↔		↔	↔			↔			↔
Volume (vph)	17	37	1206	43	13	394	25	10	2	9	31	9
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			4.0			4.0
Lane Util. Factor		1.00	0.95		1.00	0.95			1.00			1.00
Frt		1.00	0.99		1.00	0.99			0.94			0.93
Flt Protected		0.95	1.00		0.95	1.00			0.98			0.98
Satd. Flow (prot)		1770	3521		1770	3508			1712			1695
Flt Permitted		0.95	1.00		0.95	1.00			0.84			0.88
Satd. Flow (perm)		1770	3521		1770	3508			1474			1520
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	40	1311	47	14	428	27	11	2	10	34	10
RTOR Reduction (vph)	0	0	4	0	0	8	0	0	8	0	0	44
Lane Group Flow (vph)	0	58	1354	0	14	447	0	0	15	0	0	54
Turn Type	Prot	Prot			Prot			Perm			Perm	
Protected Phases	7	7	4		3	8			2			6
Permitted Phases								2			6	
Actuated Green, G (s)		1.4	16.9		0.6	16.1			6.7			6.7
Effective Green, g (s)		1.4	16.9		0.6	16.1			6.7			6.7
Actuated g/C Ratio		0.04	0.47		0.02	0.44			0.19			0.19
Clearance Time (s)		4.0	4.0		4.0	4.0			4.0			4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0			3.0			3.0
Lane Grp Cap (vph)		68	1644		29	1560			273			281
v/s Ratio Prot		c0.03	c0.38		0.01	0.13						
v/s Ratio Perm									0.01			c0.04
v/c Ratio		0.85	0.82		0.48	0.29			0.05			0.19
Uniform Delay, d1		17.3	8.4		17.6	6.4			12.1			12.5
Progression Factor		1.00	1.00		1.00	1.00			1.00			1.00
Incremental Delay, d2		60.8	3.5		12.1	0.1			0.1			0.3
Delay (s)		78.1	11.8		29.8	6.5			12.2			12.8
Level of Service		E	B		C	A			B			B
Approach Delay (s)			14.6			7.2			12.2			12.8
Approach LOS			B			A			B			B

### Intersection Summary

HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	36.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 1: Mast Blvd & Medina Dr

Existing+Construction PM

3/2/2012

Movement	SBR
Lane Configurations	
Volume (vph)	50
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	54
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	
Intersection Summary	

# HCM Unsignalized Intersection Capacity Analysis

## 2: Mast Blvd & West Hills High School Dwy

Existing+Construction PM

3/2/2012



Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations							
Volume (veh/h)	24	1224	10	15	456	12	17
Sign Control		Free			Free	Stop	
Grade		0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1330	11	16	496	13	18
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None			None		
Median storage (veh)							
Upstream signal (ft)					840		
pX, platoon unblocked	0.00						
vC, conflicting volume	0			1341		1616	671
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	0			1341		1616	671
tC, single (s)	0.0			4.1		6.8	6.9
tC, 2 stage (s)							
tF (s)	0.0			2.2		3.5	3.3
p0 queue free %	0			97		86	95
cM capacity (veh/h)	0			510		91	399
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	887	454	0	16	248	248	32
Volume Left	0	0	0	16	0	0	13
Volume Right	0	11	0	0	0	0	18
cSH	1700	1700	1700	510	1700	1700	167
Volume to Capacity	0.52	0.27	0.00	0.03	0.15	0.15	0.19
Queue Length 95th (ft)	0	0	0	2	0	0	17
Control Delay (s)	0.0	0.0	0.0	12.3	0.0	0.0	31.6
Lane LOS				B			D
Approach Delay (s)	0.0			0.4			31.6
Approach LOS							D
Intersection Summary							
Average Delay			0.6				
Intersection Capacity Utilization			44.2%		ICU Level of Service		A
Analysis Period (min)			15				