

Traffic Impact Study

Proposed Sierra Meadows Park Master Plan

East Side of Temperance Avenue at Sierra Avenue

Clovis, California

Prepared For:

City of Clovis
1033 Fifth Street
Clovis, California 93612

Date:

January 26, 2011

Job No.:

10-035.01



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1033 Fifth Street
Clovis, California 93612

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Subject: Traffic Impact Study
Proposed Sierra Meadows Park Master Plan
East Side of Temperance Avenue at Sierra Avenue
Clovis, California

Introduction

This report presents the results of a traffic impact study for the proposed Sierra Meadows Park Master Plan in Clovis, California. This analysis focuses on the anticipated effect on vehicle traffic resulting from the Project.

Project Description

The proposed Sierra Meadows Park Master Plan provides the basis for development of the proposed park. The park will include the proposed Clovis Animal Services and Pet Adoption Center, the proposed Nature Education and Rehabilitation Center, open space, a lake, and a pond. A project location map and site plan are attached.

Study Area and Time Period

The study locations were determined in coordination with City of Clovis staff based on the expected volume and distribution of Project traffic. This report includes analysis of the following locations:

- Intersection of Temperance and Sierra Avenues;
- Temperance Avenue road segment north of Sierra Avenue;
- Temperance Avenue road segment south of Sierra Avenue; and
- Sierra Avenue road segment west of Temperance Avenue.

The study time periods include the weekday a.m. and p.m. peak hours determined between 7:00 and 9:00 a.m. and between 4:00 and 6:00 p.m. The peak hours were analyzed for the following conditions:

- Existing Conditions;
- Existing Plus Project Conditions;
- Cumulative (Year 2035) Conditions Without Project; and
- Cumulative (Year 2035) Conditions With Project.

Lane Configurations and Intersection Control

The intersection of Temperance and Sierra Avenues is currently controlled by stop signs on all four approaches. The lane configurations on each approach are as follows:

Eastbound: one left-turn lane, one through lane, and one right-turn lane

Westbound: one left-turn lane, one through lane, and one right-turn lane

Northbound: one shared left/through lane and one right-turn lane

Southbound: one lane

Capital Improvement Project and Planned Configuration

The City of Clovis is currently designing a capital improvement project that will include widening of Temperance Avenue to two lanes and construction of traffic signals with protected left turns and intersection improvements at the intersection of Temperance and Sierra Avenues. The improvement are expected to be constructed within approximately the next one to two years. The lane configurations on each approach to the intersection of Temperance and Sierra Avenues will be as follows:

Eastbound: one left-turn lane, one through lane, and one right-turn lane

Westbound: one left-turn lane, one through lane, and one right-turn lane

Northbound: one left-turn lane, two through lanes, and one right-turn lane

Southbound: one left-turn lane, two through lanes, and one right-turn lane.

Temperance Avenue is ultimately planned to be a six-lane expressway at the study locations, with no planned dedicated southbound right-turn lane at Sierra Avenue.

Trip Generation

Data provided in the Institute of Transportation Engineers (ITE) *Trip Generation, 8th Edition*, were used to the extent possible to estimate the number of trips anticipated to be generated by the project. Table 1 presents the trip generation information.

Table 1
Project Trip Generation

Land Use	ITE Code	Units	A.M. Peak Hour Traffic Volumes			P.M. Peak Hour Traffic Volumes			Weekday Traffic Volumes	
			Rate Split	Enter	Exit	Rate Split	Enter	Exit	Rate	Total
Regional Park	417	22 acres	0.15 57/43	2	1	0.26 44/56	3	3	4.57	101
Pet Adoption Center	n/a	192 daily trips	0.10 50/50	10	10	0.10 50/50	10	10	1.0	192
TOTALS			-	12	11	-	13	13	-	293

Reference: *Trip Generation, 8th Edition*, Institute of Transportation Engineers 2008

Rates are reported in trips per unit.

Splits are reported as Entering/Exiting as a percentage of the total

Existing Traffic Volumes

Existing traffic volumes at the intersection of Temperance and Sierra Avenues were provided by City staff and were determined by performing manual turning movement counts at the existing study intersections between 7:00 and 9:00 a.m. and between 4:00 and 6:00 p.m. on a weekday.

Cumulative Projects

Several projects that are currently pending but not yet constructed are included in the analyses to properly assess cumulative impacts. The traffic volumes projected in the future must include traffic that will be generated by these projects. The following projects are considered in these analyses:

- Tract 5691;
- Tract 5605 with General Plan Amendment;
- Tract 5701 with General Plan Amendment;
- Tract 5965 with General Plan Amendment;
- Tract 5716; and
- Tract 5937 with General Plan Amendment.

Cumulative Year 2035 Traffic Volumes

The Council of Fresno County Governments (COG) maintains a travel model that is typically used to estimate cumulative traffic volumes. Cumulative traffic volumes without the Project for the year 2035 were projected using the 2035 COG travel model and the COG Increment Method, which is described in a document available from the COG entitled “*Model Steering Committee Recommended Procedures for Using Traffic Projections from the Fresno COG Travel Model dated December 2002.*” In general, the Increment Method projects future traffic volumes by determining the additional traffic volumes projected by the model between the base year and the horizon year. The additional traffic volumes are then added to the existing traffic volumes.

Cumulative turning movements were projected based on the methods presented in Chapter 8 of the Transportation Research Board National Cooperative Highway Research Program Report 255 entitled “*Highway Traffic Data for Urbanized Area Project Planning and Design.*” The resulting volumes were inspected to verify that the traffic volumes accommodate projects that are currently pending in the vicinity of Project site.

Significance Criteria

The Transportation Research Board *Highway Capacity Manual*, 2000, (HCM) defines level of service (LOS) as a qualitative measure describing operational characteristics within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience. LOS characteristics for both unsignalized and signalized intersections are presented in Tables 2 and 3. Level of service characteristics for road segments are presented in Table 4. The City of Clovis requires a minimum LOS D.

Table 2
Level of Service Characteristics for Unsignalized Intersections

Level of Service	Description	Average Vehicle Delay (seconds)
A	Little or no delay.	0-10
B	Short traffic delays.	>10-15
C	Average traffic delays.	>15-25
D	Long traffic delays.	>25-35
E	Very long traffic delays.	>35-50
F	Stop-and-go conditions.	>50

Reference: *Highway Capacity Manual*, Transportation Research Board

Table 3
Level of Service Characteristics for Signalized Intersections

Level of Service	Description	Average Vehicle Delay (seconds)
A	Uncongested operations; all queues clear in a single cycle.	≤10
B	Very light congestion; an occasional phase is fully utilized.	>10-20
C	Light congestion; occasional queues on approaches.	>20-35
D	Significant congestion on critical approaches, but intersection is functional. Cars required to wait through more than one cycle during short peaks. No long-standing queues formed.	>35-55
E	Severe congestion with some long-standing queues on critical approaches. Traffic queue may block nearby intersection(s) upstream of critical approach(es).	>55-80
F	Total breakdown, stop-and-go conditions.	>80

Reference: *Highway Capacity Manual*, Transportation Research Board

Table 4
Level of Service Characteristics for Roadways

Level of Service	Description
A	Primarily free flow operations
B	Reasonably unimpeded operations, ability to maneuver only slightly restricted
C	Stable operations, ability to maneuver and select operating speed affected
D	Unstable flow, speeds and ability to maneuver restricted
E	Significant delays, flow quite unstable
F	Extremely slow speeds

Reference: 1998 *Highway Capacity Manual*, Transportation Research Board

Intersection Analyses

The levels of service at the study intersection were determined using the computer program Synchro 6 (Build 614), which is based on the HCM procedures for calculating levels of service. Table 5 presents the results of the intersection analyses. The level of service is presented for the overall intersection. Project impacts are identified in bold type. The analysis output is attached to this report.

Table 5
Intersection Analysis Summary - Temperance and Sierra Avenues

Scenario	Control Type	A.M. Peak Hour		P.M. Peak Hour	
		Delay (sec)	LOS	Delay (sec)	LOS
Existing	All-way stop	30.5	D	34.5	D
Existing Plus Project	All-way stop	32.5	D	37.4	E
Existing Plus Project Mitigated	Signal	17.1	B	12.1	B
2035 No Project	Signal	14.0	B	12.8	B
2035 With Project	Signal	14.8	B	12.7	B

Road Segment Analyses

Road segment analyses were based on the Florida Department of Transportation Table 4, Generalized Peak Hour Two-Way Volumes for Florida’s Urbanized Areas dated September 4, 2009 (Class II Signalized Arterials with Major City/County Roadways adjustment). The Florida tables are commonly used for road segment analyses in central California, as they are based on HCM road segment analyses. Table 6 below presents the specific volume thresholds used in the analyses. Tables 7 and 8 present the results of the road segment analyses.

Table 6
Volume Thresholds for Roadway Levels of Service

Lanes	Divided	A	B	C	D	E	F
2	Undivided	-	-	≤918	919 - 1,332	1,333 - 1,413	>1,413
4	Divided	-	-	≤2,178	2,179 - 2,898	2,899 - 3,060	>3,060
6	Divided	-	-	≤3,411	3,412 - 4,392	4,393 - 4,635	>4,635

Reference: Florida Department of Transportation Table 4, Generalized Peak Hour Two-Way Volumes for Florida’s Urbanized Areas, 9/4/09.

Table 7
Road Segment LOS Summary – Weekday A.M. Peak Hour

Segment	Existing			Existing Plus Project			2035 No Project			2035 With Project		
	L	Vol	LOS	L	Vol	LOS	L	Vol	LOS	L	Vol	LOS
Temperance Avenue												
North of Sierra	2U	888	C	2U	890	C	6	2,849	C	6	2,851	C
South of Sierra	2U	904	C	2U	912	C	6	2,839	C	6	2,847	C
Sierra Avenue												
West of Temperance	4	252	C	4	265	C	4	370	C	4	383	C

L – Number of Lanes Vol – Volume U - Undivided

Table 8
Road Segment LOS Summary – Weekday P.M. Peak Hour

Segment	Existing			Existing Plus Project			2035 No Project			2035 With Project		
	L	Vol	LOS	L	Vol	LOS	L	Vol	LOS	L	Vol	LOS
Temperance Avenue												
North of Sierra	2U	906	C	2U	908	C	6	2,637	C	6	2,639	C
South of Sierra	2U	958	D	2U	968	D	6	2,693	C	6	2,703	C
Sierra Avenue												
West of Temperance	4	266	C	4	280	C	4	378	C	4	392	C

L – Number of Lanes Vol – Volume U - Undivided

Discussion of Analyses

The results of the analyses indicate that the study intersection and road segments are currently operating at acceptable levels of service. However, construction of the proposed Project would cause the intersection of Temperance and Sierra Avenues to operate at a substandard LOS E. The impact will be mitigated with construction of the pending capital improvement project that will construct traffic signals and additional lanes at the intersection. The study road segments are expected to operate at acceptable levels of service after construction of the Project.

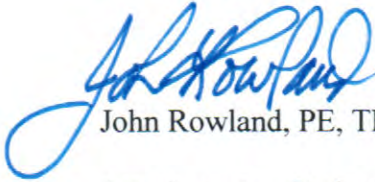
The year 2035 cumulative conditions analyses indicate that the study locations are expected to operate at acceptable levels of service with construction of the Project.

Conclusions

Generally-accepted traffic engineering principles and methods were employed to estimate the amount of traffic expected to be generated by the Project and to analyze the traffic conditions expected to exist in the future. The conclusion of this traffic impact study is that the proposed Project will cause an opening day impact by decreasing the LOS at the intersection of Temperance and Sierra Avenues from D to E. However, the impact will be mitigated by the pending capital improvement project that will construct traffic signals and additional lanes at the intersection. After construction of the mitigation, the study locations are expected to operate at acceptable levels of service through the year 2035, including implementation of the ultimate six-lane width of Temperance Avenue.

Thank you for the opportunity to perform this traffic impact study. Please feel free to call our office if you have any questions.

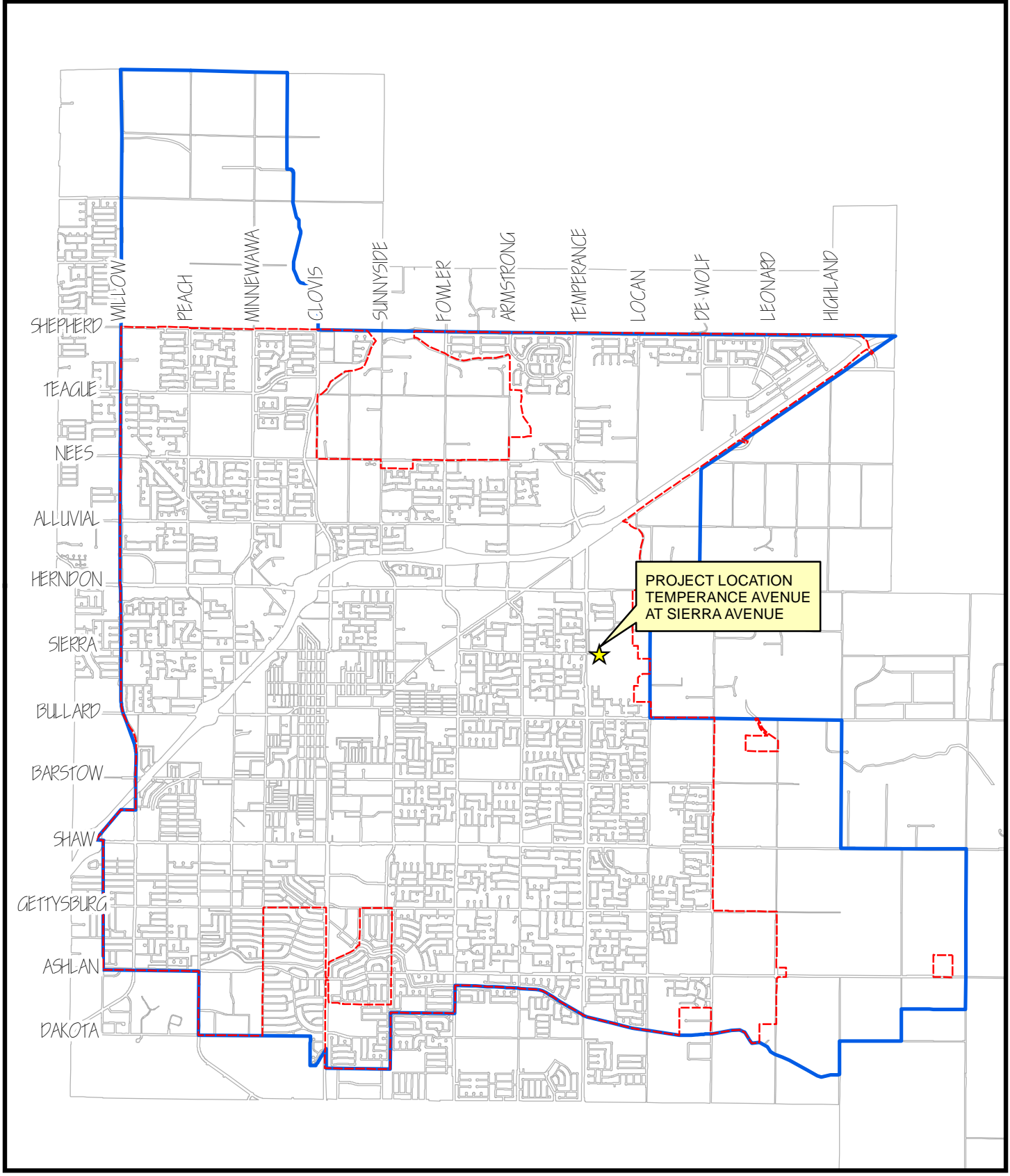
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John Rowland, PE, TE



1-26-11

Attachments: Project Location Map
Site Plan
Traffic Count Data Sheets
2010 and 2035 Fresno County Travel Model Output
Intersection Analyses
Florida Table 4



PROJECT LOCATION
 TEMPERANCE AVENUE
 AT SIERRA AVENUE



OCTOBER 12, 2010

PROJECT LOCATION MAP

CITY LIMITS SPHERE OF INFLUENCE



1" = 5500'



SIERRA MEADOWS PARK MASTER PLAN

Incorporating the Clovis Animal Services & Pet Adoption Center and Nature Education & Rehabilitation Center
 Clovis, California

PEAK HOUR TURNING COUNTS
TEMPERANCE AND SIERRA

AM PEAK HOUR

DAY	Date	Begin Time	End Time
Friday	10/22/2010	08:45	09:15
		07:00	07:15
		07:15	07:30
		07:30	07:45
		07:45	08:00
		08:00	08:15
		08:15	08:30
		08:30	08:45
		08:45	09:00

% of All Vehicles Counted
% of Total Vehicles Counted

AM PEAK HOUR 7:15 to 8:15 AM

Direction	Right Turns	Thru	Left Turns	Vehicle Totals
SOUTHBOUND	0	385	7	403
	0.0%	95.3%	1.7%	100.0%
WESTBOUND	0	7	42	49
	0.0%	14.3%	85.7%	100.0%
EASTBOUND	0	0	0	0
	0.0%	0.0%	0.0%	0.0%
NORTHBOUND	0	43	679	722
	0.0%	5.9%	94.1%	100.0%
GRAND TOTAL ALL DIRECTIONS	0	392	728	1120
	0.0%	35.0%	65.0%	100.0%
WEST AND EAST TOTALS	0	7	42	49
	0.0%	14.3%	85.7%	100.0%
SOUTH AND NORTH TOTALS	0	43	722	765
	0.0%	5.9%	94.1%	100.0%

% of All Vehicles Counted
% of Total Vehicles Counted

PM PEAK HOUR

DAY	Date	Begin Time	End Time
Wed	10/20/2010	16:15	16:45
		16:30	16:45
		16:45	17:00
		17:00	17:15
		17:15	17:30
		17:30	17:45
		17:45	18:00
		18:00	18:15
		18:15	18:30

% of All Vehicles Counted
% of Total Vehicles Counted

PM PEAK HOUR 4:45 to 5:45 PM

Direction	Right Turns	Thru	Left Turns	Vehicle Totals
SOUTHBOUND	0	63	482	545
	0.0%	11.3%	88.7%	100.0%
WESTBOUND	0	4	24	28
	0.0%	14.3%	85.7%	100.0%
EASTBOUND	0	0	0	0
	0.0%	0.0%	0.0%	0.0%
NORTHBOUND	0	40	303	343
	0.0%	11.6%	88.4%	100.0%
GRAND TOTAL ALL DIRECTIONS	0	67	789	856
	0.0%	7.8%	92.2%	100.0%
WEST AND EAST TOTALS	0	4	24	28
	0.0%	14.3%	85.7%	100.0%
SOUTH AND NORTH TOTALS	0	40	789	829
	0.0%	4.8%	95.2%	100.0%

% of All Vehicles Counted
% of Total Vehicles Counted

AM PEAK HOUR 7:15 to 8:15 AM

Direction	Right Turns	Thru	Left Turns	Vehicle Totals
SOUTHBOUND	0	26	269	295
	0.0%	8.7%	91.3%	100.0%
WESTBOUND	0	5	27	32
	0.0%	15.6%	84.4%	100.0%
EASTBOUND	0	0	0	0
	0.0%	0.0%	0.0%	0.0%
NORTHBOUND	0	26	498	524
	0.0%	4.9%	95.1%	100.0%
GRAND TOTAL ALL DIRECTIONS	0	31	794	825
	0.0%	3.8%	96.2%	100.0%
WEST AND EAST TOTALS	0	5	27	32
	0.0%	15.6%	84.4%	100.0%
SOUTH AND NORTH TOTALS	0	26	767	793
	0.0%	3.3%	96.7%	100.0%

AM PEAK HOUR 7:15 to 8:15 AM

Direction	Right Turns	Thru	Left Turns	Vehicle Totals
SOUTHBOUND	0	26	269	295
	0.0%	8.7%	91.3%	100.0%
WESTBOUND	0	5	27	32
	0.0%	15.6%	84.4%	100.0%
EASTBOUND	0	0	0	0
	0.0%	0.0%	0.0%	0.0%
NORTHBOUND	0	26	498	524
	0.0%	4.9%	95.1%	100.0%
GRAND TOTAL ALL DIRECTIONS	0	31	794	825
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WEST AND EAST TOTALS	0	5	27	32
	0.0%	15.6%	84.4%	100.0%
SOUTH AND NORTH TOTALS	0	26	767	793
	0.0%	3.3%	96.7%	100.0%

% of All Vehicles Counted
% of Total Vehicles Counted

PM PEAK HOUR 4:45 to 5:45 PM

Direction	Right Turns	Thru	Left Turns	Vehicle Totals
SOUTHBOUND	0	63	482	545
	0.0%	11.3%	88.7%	100.0%
WESTBOUND	0	4	24	28
	0.0%	14.3%	85.7%	100.0%
EASTBOUND	0	0	0	0
	0.0%	0.0%	0.0%	0.0%
NORTHBOUND	0	40	303	343
	0.0%	11.6%	88.4%	100.0%
GRAND TOTAL ALL DIRECTIONS	0	67	789	856
	0.0%	7.8%	92.2%	100.0%
WEST AND EAST TOTALS	0	4	24	28
	0.0%	14.3%	85.7%	100.0%
SOUTH AND NORTH TOTALS	0	40	789	829
	0.0%	4.8%	95.2%	100.0%

% of All Vehicles Counted
% of Total Vehicles Counted

AM PEAK HOUR 7:15 to 8:15 AM

Direction	Right Turns	Thru	Left Turns	Vehicle Totals
SOUTHBOUND	0	31	403	434
	0.0%	7.1%	92.9%	100.0%
WESTBOUND	0	7	42	49
	0.0%	14.3%	85.7%	100.0%
EASTBOUND	0	0	0	0
	0.0%	0.0%	0.0%	0.0%
NORTHBOUND	0	43	679	722
	0.0%	5.9%	94.1%	100.0%
GRAND TOTAL ALL DIRECTIONS	0	38	724	762
	0.0%	5.0%	95.0%	100.0%
WEST AND EAST TOTALS	0	7	42	49
	0.0%	14.3%	85.7%	100.0%
SOUTH AND NORTH TOTALS	0	43	724	767
	0.0%	5.6%	94.4%	100.0%

% of All Vehicles Counted
% of Total Vehicles Counted

PM PEAK HOUR 4:45 to 5:45 PM

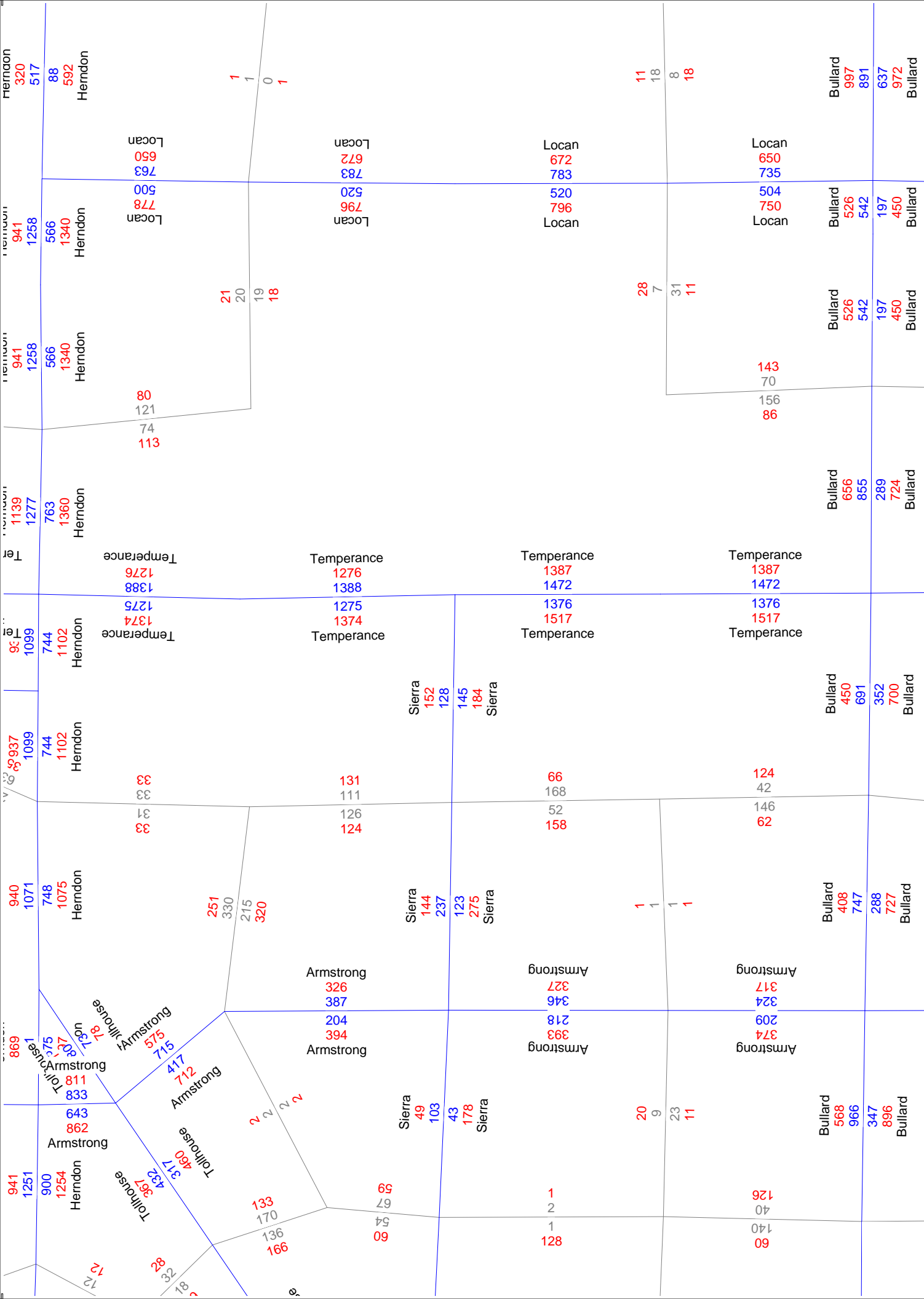
Direction	Right Turns	Thru	Left Turns	Vehicle Totals
SOUTHBOUND	0	63	482	545
	0.0%	11.3%	88.7%	100.0%
WESTBOUND	0	4	24	28
	0.0%	14.3%	85.7%	100.0%
EASTBOUND	0	0	0	0
	0.0%	0.0%	0.0%	0.0%
NORTHBOUND	0	40	303	343
	0.0%	11.6%	88.4%	100.0%
GRAND TOTAL ALL DIRECTIONS	0	67	789	856
	0.0%	7.8%	92.2%	100.0%
WEST AND EAST TOTALS	0	4	24	28
	0.0%	14.3%	85.7%	100.0%
SOUTH AND NORTH TOTALS	0	40	789	829
	0.0%	4.8%	95.2%	100.0%

% of All Vehicles Counted
% of Total Vehicles Counted

AM PEAK HOUR 7:15 to 8:15 AM

Direction	Right Turns	Thru	Left Turns	Vehicle Totals
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WESTBOUND	0	5	27	32
	0.0%	15.6%	84.4%	100.0%
EASTBOUND	0	0	0	0
	0.0%	0.0%	0.0%	0.0%
NORTHBOUND	0	26	498	524
	0.0%	4.9%	95.1%	100.0%
GRAND TOTAL ALL DIRECTIONS	0	31	794	825
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	0.0%	3.3%	96.7%	100.0%






















% of All Vehicles Counted
% of Total Vehicles Counted



2035 Council of Fresno County Governments Travel Demand Model
AM and PM Peak Hour Traffic Volumes

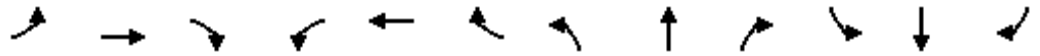
HCM Unsignalized Intersection Capacity Analysis
 1: Sierra Avenue & Temperance Avenue

Existing-AM
 12/1/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	87	36	44	35	27	5	32	498	26	3	269	26
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	95	39	48	38	29	5	35	541	28	3	292	28
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1					
Volume Total (vph)	95	87	38	35	576	28	324					
Volume Left (vph)	95	0	38	0	35	0	3					
Volume Right (vph)	0	48	0	5	0	28	28					
Hadj (s)	0.53	-0.35	0.53	-0.08	0.06	-0.67	-0.02					
Departure Headway (s)	7.8	6.9	8.1	7.5	5.9	5.2	6.3					
Degree Utilization, x	0.21	0.17	0.09	0.07	0.95	0.04	0.56					
Capacity (veh/h)	445	500	419	452	599	673	559					
Control Delay (s)	11.6	10.1	10.7	9.9	48.0	7.2	17.1					
Approach Delay (s)	10.9		10.3		46.1		17.1					
Approach LOS	B		B		E		C					
Intersection Summary												
Delay			30.5									
HCM Level of Service			D									
Intersection Capacity Utilization			64.8%		ICU Level of Service		C					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 1: Sierra Avenue & Temperance Avenue

Existing-PM
 12/1/2010

























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	42	33	59	29	24	4	45	303	40	12	482	63
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	36	64	32	26	4	49	329	43	13	524	68

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	46	100	32	30	378	43	605
Volume Left (vph)	46	0	32	0	49	0	13
Volume Right (vph)	0	64	0	4	0	43	68
Hadj (s)	0.53	-0.41	0.53	-0.07	0.10	-0.67	-0.03
Departure Headway (s)	8.0	7.0	8.2	7.6	6.1	5.4	5.8
Degree Utilization, x	0.10	0.19	0.07	0.06	0.64	0.06	0.98
Capacity (veh/h)	438	495	417	450	574	658	612
Control Delay (s)	10.7	10.5	10.7	9.9	18.3	7.5	54.7
Approach Delay (s)	10.5		10.3		17.2		54.7
Approach LOS	B		B		C		F

Intersection Summary	
Delay	34.5
HCM Level of Service	D
Intersection Capacity Utilization	55.8%
ICU Level of Service	B
Analysis Period (min)	15























HCM Unsignalized Intersection Capacity Analysis
 1: Sierra Avenue & Temperance Avenue

Existing Plus Project-AM
 12/1/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	87	43	44	39	33	6	32	498	30	4	269	26
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	95	47	48	42	36	7	35	541	33	4	292	28
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1					
Volume Total (vph)	95	95	42	42	576	33	325					
Volume Left (vph)	95	0	42	0	35	0	4					
Volume Right (vph)	0	48	0	7	0	33	28					
Hadj (s)	0.53	-0.32	0.53	-0.07	0.06	-0.67	-0.02					
Departure Headway (s)	7.9	7.1	8.3	7.6	6.0	5.3	6.4					
Degree Utilization, x	0.21	0.19	0.10	0.09	0.97	0.05	0.58					
Capacity (veh/h)	441	494	417	450	590	661	551					
Control Delay (s)	11.8	10.5	10.9	10.2	52.4	7.4	17.8					
Approach Delay (s)	11.1		10.6		50.0		17.8					
Approach LOS	B		B		F		C					
Intersection Summary												
Delay			32.5									
HCM Level of Service			D									
Intersection Capacity Utilization			63.4%		ICU Level of Service			B				
Analysis Period (min)			15									

























HCM Unsignalized Intersection Capacity Analysis
 1: Sierra Avenue & Temperance Avenue

Existing Plus Project-PM
 12/1/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop				Stop			Stop	
Volume (vph)	42	40	59	34	31	5	45	303	45	13	482	63
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	43	64	37	34	5	49	329	49	14	524	68
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1					
Volume Total (vph)	46	108	37	39	378	49	607					
Volume Left (vph)	46	0	37	0	49	0	14					
Volume Right (vph)	0	64	0	5	0	49	68					
Hadj (s)	0.53	-0.38	0.53	-0.06	0.10	-0.67	-0.03					
Departure Headway (s)	8.1	7.2	8.4	7.7	6.3	5.5	5.9					
Degree Utilization, x	0.10	0.21	0.09	0.08	0.66	0.07	1.00					
Capacity (veh/h)	434	488	415	447	563	645	602					
Control Delay (s)	10.8	10.9	10.9	10.3	19.4	7.7	61.0					
Approach Delay (s)	10.9		10.6		18.1		61.0					
Approach LOS	B		B		C		F					
Intersection Summary												
Delay			37.4									
HCM Level of Service			E									
Intersection Capacity Utilization			55.5%	ICU Level of Service			B					
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
1: Sierra Avenue & Temperance Avenue

Existing Plus Project-AM-Mitigated
12/1/2010

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
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	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583	
Volume (vph)	87	43	44	39	33	6	32	498	30	4	269	26	
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)	95	47	48	42	36	7	35	541	33	4	292	28	
RTOR Reduction (vph)	0	0	44	0	0	7	0	0	13	0	0	12	
Lane Group Flow (vph)	95	47	4	42	36	0	35	541	20	4	292	16	
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm	
Protected Phases	7	4		3	8		5	2		1	6		
Permitted Phases			4			8			2			6	
Actuated Green, G (s)	3.6	3.6	3.6	3.1	3.1	3.1	3.0	35.9	35.9	1.2	34.1	34.1	
Effective Green, g (s)	3.6	4.5	4.5	3.1	4.0	4.0	3.0	36.8	36.8	1.2	35.0	35.0	
Actuated g/C Ratio	0.06	0.07	0.07	0.05	0.06	0.06	0.05	0.60	0.60	0.02	0.57	0.57	
Clearance Time (s)	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	103	136	116	89	121	103	86	2114	946	34	2011	899	
v/s Ratio Prot	c0.05	c0.03		0.02	0.02		c0.02	c0.15		0.00	0.08		
v/s Ratio Perm			0.00			0.00			0.01			0.01	
v/c Ratio	0.92	0.35	0.03	0.47	0.30	0.00	0.41	0.26	0.02	0.12	0.15	0.02	
Uniform Delay, d1	28.9	27.1	26.5	28.5	27.5	26.9	28.4	5.9	5.1	29.7	6.3	5.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	64.0	1.5	0.1	3.9	1.4	0.0	3.1	0.1	0.0	1.5	0.0	0.0	
Delay (s)	92.8	28.7	26.6	32.4	28.8	27.0	31.6	6.0	5.1	31.2	6.3	5.8	
Level of Service	F	C	C	C	C	C	C	A	A	C	A	A	
Approach Delay (s)		60.2			30.4			7.4			6.6		
Approach LOS		E			C			A			A		
Intersection Summary													
HCM Average Control Delay			17.1									HCM Level of Service	B
HCM Volume to Capacity ratio			0.29										
Actuated Cycle Length (s)			61.6									Sum of lost time (s)	8.0
Intersection Capacity Utilization			38.6%									ICU Level of Service	A
Analysis Period (min)			15										
c Critical Lane Group													

Queues
1: Sierra Avenue & Temperance Avenue

Existing Plus Project-AM-Mitigated
12/1/2010



























Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	95	47	48	42	36	7	35	541	33	4	292	28
v/c Ratio	0.35	0.15	0.16	0.17	0.13	0.03	0.15	0.20	0.03	0.02	0.12	0.02
Control Delay	20.3	17.8	8.9	20.1	18.8	13.5	20.1	7.4	5.5	23.0	9.6	7.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.3	17.8	8.9	20.1	18.8	13.5	20.1	7.4	5.5	23.0	9.6	7.3
Queue Length 50th (ft)	2	1	0	1	1	0	1	0	0	0	0	0
Queue Length 95th (ft)	69	39	24	39	33	10	34	120	15	9	70	15
Internal Link Dist (ft)		448			96			677			274	
Turn Bay Length (ft)												
Base Capacity (vph)	323	561	510	292	535	460	291	2667	1201	280	2588	1165
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.08	0.09	0.14	0.07	0.02	0.12	0.20	0.03	0.01	0.11	0.02

Intersection Summary

HCM Signalized Intersection Capacity Analysis
 1: Sierra Avenue & Temperance Avenue

Existing Plus Project-PM-Mitigated
 12/1/2010

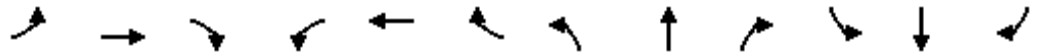
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Volume (vph)	42	40	59	34	31	5	45	303	45	13	482	63
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)	46	43	64	37	34	5	49	329	49	14	524	68
RTOR Reduction (vph)	0	0	60	0	0	5	0	0	19	0	0	28
Lane Group Flow (vph)	46	43	4	37	34	0	49	329	30	14	524	40
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	3.3	3.3	3.3	3.2	3.2	3.2	3.4	39.2	39.2	1.4	37.2	37.2
Effective Green, g (s)	3.3	4.2	4.2	3.2	4.1	4.1	3.4	40.1	40.1	1.4	38.1	38.1
Actuated g/C Ratio	0.05	0.06	0.06	0.05	0.06	0.06	0.05	0.62	0.62	0.02	0.59	0.59
Clearance Time (s)	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	90	121	102	87	118	100	93	2187	978	38	2078	929
v/s Ratio Prot	c0.03	c0.02		0.02	0.02		c0.03	0.09		0.01	c0.15	
v/s Ratio Perm			0.00			0.00			0.02			0.03
v/c Ratio	0.51	0.36	0.04	0.43	0.29	0.00	0.53	0.15	0.03	0.37	0.25	0.04
Uniform Delay, d1	30.0	29.1	28.5	30.0	29.0	28.5	30.0	5.2	4.8	31.3	6.5	5.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.8	1.8	0.2	3.3	1.4	0.0	5.3	0.0	0.0	6.0	0.1	0.0
Delay (s)	34.8	30.8	28.6	33.3	30.4	28.5	35.3	5.3	4.8	37.3	6.6	5.7
Level of Service	C	C	C	C	C	C	D	A	A	D	A	A
Approach Delay (s)		31.1			31.7			8.7			7.2	
Approach LOS		C			C			A			A	

Intersection Summary

HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	64.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	35.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues
1: Sierra Avenue & Temperance Avenue

Existing Plus Project-PM-Mitigated
12/1/2010



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	46	43	64	37	34	5	49	329	49	14	524	68
v/c Ratio	0.19	0.16	0.22	0.16	0.13	0.02	0.21	0.12	0.04	0.07	0.21	0.06
Control Delay	20.7	19.4	9.1	20.7	19.6	15.0	20.6	6.9	4.7	23.4	9.6	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.7	19.4	9.1	20.7	19.6	15.0	20.6	6.9	4.7	23.4	9.6	5.1
Queue Length 50th (ft)	1	1	0	1	1	0	1	0	0	1	0	0
Queue Length 95th (ft)	41	38	29	36	32	8	43	75	19	19	125	24
Internal Link Dist (ft)		448			96			677			274	
Turn Bay Length (ft)												
Base Capacity (vph)	302	527	494	301	527	451	302	2711	1224	291	2554	1161
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.08	0.13	0.12	0.06	0.01	0.16	0.12	0.04	0.05	0.21	0.06

Intersection Summary

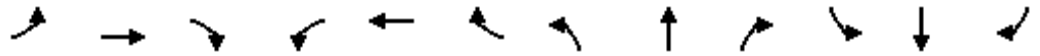
HCM Signalized Intersection Capacity Analysis
 1: Sierra Avenue & Temperance Avenue

Cumulative 2035 No Project-AM
 12/1/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	5085	1583	1770	5085	1583
Volume (vph)	143	46	72	45	35	15	41	1445	34	11	1202	33
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)	155	50	78	49	38	16	45	1571	37	12	1307	36
RTOR Reduction (vph)	0	0	67	0	0	15	0	0	17	0	0	18
Lane Group Flow (vph)	155	50	11	49	38	1	45	1571	20	12	1307	18
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	8.6	8.8	8.8	4.6	4.8	4.8	4.5	37.5	37.5	1.4	34.4	34.4
Effective Green, g (s)	8.6	9.7	9.7	4.6	5.7	5.7	4.5	38.4	38.4	1.4	35.3	35.3
Actuated g/C Ratio	0.12	0.14	0.14	0.07	0.08	0.08	0.06	0.55	0.55	0.02	0.50	0.50
Clearance Time (s)	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	217	258	219	116	151	129	114	2786	867	35	2561	797
v/s Ratio Prot	c0.09	c0.03		0.03	0.02		c0.03	c0.31		0.01	0.26	
v/s Ratio Perm			0.01			0.00			0.01			0.01
v/c Ratio	0.71	0.19	0.05	0.42	0.25	0.01	0.39	0.56	0.02	0.34	0.51	0.02
Uniform Delay, d1	29.6	26.7	26.2	31.5	30.2	29.6	31.5	10.4	7.3	33.9	11.6	8.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.6	0.4	0.1	2.5	0.9	0.0	2.2	0.3	0.0	5.8	0.2	0.0
Delay (s)	40.2	27.1	26.3	33.9	31.1	29.6	33.7	10.6	7.3	39.7	11.8	8.7
Level of Service	D	C	C	C	C	C	C	B	A	D	B	A
Approach Delay (s)		34.0			32.2			11.2			12.0	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM Average Control Delay			14.0	HCM Level of Service				B				
HCM Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			70.1	Sum of lost time (s)				16.0				
Intersection Capacity Utilization			55.3%	ICU Level of Service				B				
Analysis Period (min)			15									
c Critical Lane Group												

Queues
1: Sierra Avenue & Temperance Avenue

Cumulative 2035 No Project-AM
12/1/2010



























Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	155	50	78	49	38	16	45	1571	37	12	1307	36
v/c Ratio	0.67	0.19	0.27	0.27	0.17	0.08	0.24	0.53	0.04	0.08	0.50	0.04
Control Delay	42.4	26.5	9.9	30.3	27.0	13.9	29.9	10.6	4.6	31.1	13.6	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.4	26.5	9.9	30.3	27.0	13.9	29.9	10.6	4.6	31.1	13.6	5.5
Queue Length 50th (ft)	58	18	0	18	14	0	16	125	0	4	146	0
Queue Length 95th (ft)	#152	47	33	48	39	16	46	260	16	19	209	16
Internal Link Dist (ft)		448			96			677			274	
Turn Bay Length (ft)												
Base Capacity (vph)	232	451	442	211	417	366	211	3019	955	198	2659	845
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.11	0.18	0.23	0.09	0.04	0.21	0.52	0.04	0.06	0.49	0.04

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

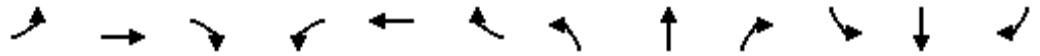
HCM Signalized Intersection Capacity Analysis
 1: Sierra Avenue & Temperance Avenue

Cumulative 2035 No Project-PM
 12/1/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	5085	1583	1770	5085	1583
Volume (vph)	69	42	97	37	31	13	58	1122	52	25	1327	81
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)	75	46	105	40	34	14	63	1220	57	27	1442	88
RTOR Reduction (vph)	0	0	92	0	0	13	0	0	25	0	0	40
Lane Group Flow (vph)	75	46	13	40	34	1	63	1220	32	27	1442	48
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	5.2	7.9	7.9	3.4	6.1	6.1	5.1	40.5	40.5	3.2	38.6	38.6
Effective Green, g (s)	5.2	8.8	8.8	3.4	7.0	7.0	5.1	41.4	41.4	3.2	39.5	39.5
Actuated g/C Ratio	0.07	0.12	0.12	0.05	0.10	0.10	0.07	0.57	0.57	0.04	0.54	0.54
Clearance Time (s)	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	126	225	191	83	179	152	124	2892	900	78	2759	859
v/s Ratio Prot	c0.04	c0.02		0.02	0.02		c0.04	0.24		0.02	c0.28	
v/s Ratio Perm			0.01			0.00			0.02			0.03
v/c Ratio	0.60	0.20	0.07	0.48	0.19	0.01	0.51	0.42	0.04	0.35	0.52	0.06
Uniform Delay, d1	32.8	28.8	28.4	33.8	30.3	29.8	32.6	8.9	6.9	33.8	10.6	7.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.4	0.5	0.1	4.4	0.5	0.0	3.3	0.1	0.0	2.7	0.2	0.0
Delay (s)	40.1	29.3	28.5	38.2	30.8	29.8	35.9	9.0	6.9	36.4	10.8	7.9
Level of Service	D	C	C	D	C	C	D	A	A	D	B	A
Approach Delay (s)		32.5			34.0			10.2			11.1	
Approach LOS		C			C			B			B	
Intersection Summary												
HCM Average Control Delay			12.8				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			72.8				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			49.5%				ICU Level of Service		A			
Analysis Period (min)			15									
c Critical Lane Group												

Queues
1: Sierra Avenue & Temperance Avenue

Cumulative 2035 No Project-PM
12/1/2010



























Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	75	46	105	40	34	14	63	1220	57	27	1442	88
v/c Ratio	0.37	0.15	0.30	0.22	0.15	0.07	0.32	0.37	0.05	0.15	0.47	0.09
Control Delay	28.6	22.0	8.2	28.0	24.3	13.2	27.8	10.9	5.0	27.5	14.1	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.6	22.0	8.2	28.0	24.3	13.2	27.8	10.9	5.0	27.5	14.1	4.3
Queue Length 50th (ft)	25	11	0	13	11	0	21	87	0	9	167	0
Queue Length 95th (ft)	62	41	36	39	33	13	54	195	21	30	#247	26
Internal Link Dist (ft)		448			96			677			274	
Turn Bay Length (ft)												
Base Capacity (vph)	223	463	473	215	434	379	223	3291	1045	215	3080	994
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.10	0.22	0.19	0.08	0.04	0.28	0.37	0.05	0.13	0.47	0.09

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

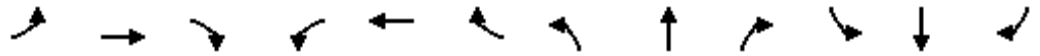
HCM Signalized Intersection Capacity Analysis
1: Sierra Avenue & Temperance Avenue

Cumulative 2035 Plus Project-AM
12/1/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	5085	1583	1770	5085	1583
Volume (vph)	143	53	72	49	41	16	41	1445	38	12	1202	33
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)	155	58	78	53	45	17	45	1571	41	13	1307	36
RTOR Reduction (vph)	0	0	64	0	0	15	0	0	20	0	0	19
Lane Group Flow (vph)	155	58	14	53	45	2	45	1571	21	13	1307	17
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	8.6	11.2	11.2	3.1	5.7	5.7	3.1	32.3	32.3	1.4	30.6	30.6
Effective Green, g (s)	8.6	12.1	12.1	3.1	6.6	6.6	3.1	33.2	33.2	1.4	31.5	31.5
Actuated g/C Ratio	0.13	0.18	0.18	0.05	0.10	0.10	0.05	0.50	0.50	0.02	0.48	0.48
Clearance Time (s)	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	231	343	291	83	187	159	83	2566	799	38	2434	758
v/s Ratio Prot	c0.09	0.03		0.03	c0.02		c0.03	c0.31		0.01	0.26	
v/s Ratio Perm			0.01			0.00			0.01			0.01
v/c Ratio	0.67	0.17	0.05	0.64	0.24	0.01	0.54	0.61	0.03	0.34	0.54	0.02
Uniform Delay, d1	27.3	22.6	22.1	30.8	27.3	26.7	30.7	11.7	8.2	31.7	12.0	9.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.4	0.2	0.1	15.0	0.7	0.0	7.1	0.4	0.0	5.3	0.2	0.0
Delay (s)	34.7	22.9	22.2	45.8	28.0	26.7	37.7	12.1	8.2	37.1	12.3	9.1
Level of Service	C	C	C	D	C	C	D	B	A	D	B	A
Approach Delay (s)		29.0			36.0			12.7			12.4	
Approach LOS		C			D			B			B	
Intersection Summary												
HCM Average Control Delay			14.8				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			65.8				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			55.3%				ICU Level of Service		B			
Analysis Period (min)			15									
c Critical Lane Group												

Queues
1: Sierra Avenue & Temperance Avenue

Cumulative 2035 Plus Project-AM
12/1/2010



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	155	58	78	53	45	17	45	1571	41	13	1307	36
v/c Ratio	0.62	0.16	0.21	0.28	0.18	0.08	0.24	0.56	0.05	0.08	0.51	0.04
Control Delay	36.0	20.9	8.3	28.3	23.7	12.6	27.7	12.5	4.9	27.9	13.3	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.0	20.9	8.3	28.3	23.7	12.6	27.7	12.5	4.9	27.9	13.3	6.2
Queue Length 50th (ft)	41	10	0	14	11	0	12	124	0	3	96	0
Queue Length 95th (ft)	#139	48	31	48	40	15	42	#297	17	19	213	17
Internal Link Dist (ft)		448			96			677			274	
Turn Bay Length (ft)												
Base Capacity (vph)	250	521	499	219	448	394	218	2785	885	211	2576	820
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.11	0.16	0.24	0.10	0.04	0.21	0.56	0.05	0.06	0.51	0.04

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

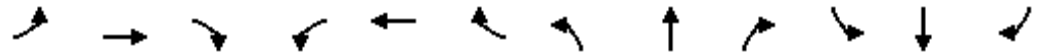
HCM Signalized Intersection Capacity Analysis
 1: Sierra Avenue & Temperance Avenue

Cumulative 2035 Plus Project-PM
 12/1/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	5085	1583	1770	5085	1583
Volume (vph)	69	49	97	42	38	14	58	1122	57	26	1327	81
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)	75	53	105	46	41	15	63	1220	62	28	1442	88
RTOR Reduction (vph)	0	0	96	0	0	14	0	0	26	0	0	40
Lane Group Flow (vph)	75	53	9	46	41	1	63	1220	36	28	1442	48
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	5.2	5.5	5.5	5.0	5.3	5.3	5.1	40.2	40.2	3.2	38.3	38.3
Effective Green, g (s)	5.2	6.4	6.4	5.0	6.2	6.2	5.1	41.1	41.1	3.2	39.2	39.2
Actuated g/C Ratio	0.07	0.09	0.09	0.07	0.09	0.09	0.07	0.57	0.57	0.04	0.55	0.55
Clearance Time (s)	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9	4.0	4.9	4.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	128	166	141	123	161	137	126	2915	907	79	2780	865
v/s Ratio Prot	c0.04	c0.03		0.03	0.02		c0.04	0.24		0.02	c0.28	
v/s Ratio Perm			0.01			0.00			0.02			0.03
v/c Ratio	0.59	0.32	0.07	0.37	0.25	0.01	0.50	0.42	0.04	0.35	0.52	0.06
Uniform Delay, d1	32.2	30.6	29.9	31.9	30.6	29.9	32.1	8.6	6.7	33.2	10.3	7.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.7	1.1	0.2	1.9	0.8	0.0	3.1	0.1	0.0	2.7	0.2	0.0
Delay (s)	38.9	31.7	30.1	33.8	31.4	30.0	35.2	8.7	6.7	36.0	10.4	7.6
Level of Service	D	C	C	C	C	C	D	A	A	D	B	A
Approach Delay (s)		33.3			32.3			9.8			10.7	
Approach LOS		C			C			A			B	
Intersection Summary												
HCM Average Control Delay			12.7			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			71.7	Sum of lost time (s)			12.0					
Intersection Capacity Utilization			49.5%	ICU Level of Service			A					
Analysis Period (min)			15									
c Critical Lane Group												

Queues
1: Sierra Avenue & Temperance Avenue

Cumulative 2035 Plus Project-PM
12/1/2010



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	75	53	105	46	41	15	63	1220	62	28	1442	88
v/c Ratio	0.37	0.22	0.35	0.24	0.17	0.07	0.32	0.37	0.06	0.15	0.47	0.09
Control Delay	28.7	24.5	9.2	27.2	24.4	12.9	27.9	11.0	4.9	27.6	14.2	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.7	24.5	9.2	27.2	24.4	12.9	27.9	11.0	4.9	27.6	14.2	4.3
Queue Length 50th (ft)	25	17	0	15	14	0	21	87	0	9	168	0
Queue Length 95th (ft)	62	45	36	43	37	14	54	195	22	31	#247	26
Internal Link Dist (ft)		448			96			677			274	
Turn Bay Length (ft)												
Base Capacity (vph)	225	438	453	224	437	383	225	3284	1044	216	3075	992
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.12	0.23	0.21	0.09	0.04	0.28	0.37	0.06	0.13	0.47	0.09

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

TABLE 4

Generalized Peak Hour Two-Way Volumes for Florida's Urbanized Areas¹

9/4/09

STATE SIGNALIZED ARTERIALS						FREEWAYS					
Class I (>0.00 to 1.99 signalized intersections per mile)						Lanes	B	C	D	E	
Lanes	Median	B	C	D	E	4	4,000	5,500	6,770	7,300	
2	Undivided	930	1,500	1,600	***	6	6,000	8,320	10,150	11,290	
4	Divided	2,840	3,440	3,560	***	8	8,000	11,050	13,480	15,270	
6	Divided	4,370	5,200	5,360	***	10	10,000	13,960	16,930	19,250	
8	Divided	5,900	6,970	7,160	***	12	13,730	18,600	21,950	23,230	
Class II (2.00 to 4.50 signalized intersections per mile)						Freeway Adjustments					
Lanes	Median	B	C	D	E	Auxiliary Lanes	Ramp Metering	Oversaturated Conditions*			
2	Undivided	**	1,020	1,480	1,570	+ 1,800	+ 5%	-10% of E			
4	Divided	**	2,420	3,220	3,400						
6	Divided	**	3,790	4,880	5,150						
8	Divided	**	5,150	6,530	6,880						
Class III/IV (more than 4.50 signalized intersections per mile)						UNINTERRUPTED FLOW HIGHWAYS					
Lanes	Median	B	C	D	E	Lanes	Median	B	C	D	E
2	Undivided	**	500	1,150	1,440	2	Undivided	730	1,460	2,080	2,620
4	Divided	**	1,220	2,730	3,100	4	Divided	3,220	4,660	6,040	6,840
6	Divided	**	1,910	4,240	4,680	6	Divided	4,840	6,990	9,060	10,280
8	Divided	**	2,620	5,770	6,280	Uninterrupted Flow Highway Adjustments					
						Lanes	Median	Exclusive left lanes	Adjustment factors		
						2	Divided	Yes	+5%		
						Multi	Undivided	Yes	-5%		
						Multi	Undivided	No	-25%		
Non-State Signalized Roadway Adjustments (Alter corresponding state volumes by the indicated percent.)						BICYCLE MODE² (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)					
Major City/County Roadways - 10%						Paved Shoulder/ Bicycle Lane					
Other Signalized Roadways - 35%						Coverage	B	C	D	E	
						0-49%	**	310	1,180	>1,180	
						50-84%	240	360	>360	***	
						85-100%	620	>620	***	***	
State & Non-State Signalized Roadway Adjustments (Alter corresponding state volumes by the indicated percent.)						PEDESTRIAN MODE² (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)					
Divided/Undivided & Turn Lane Adjustments						Sidewalk Coverage					
Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors		0-49%	**	**	480	1,390	
2	Divided	Yes	No	+5%		50-84%	**	**	1,100	1,820	
2	Undivided	No	No	-20%		85-100%	**	1,100	1,820	>1,820	
Multi	Undivided	Yes	No	-5%		BUS MODE (Scheduled Fixed Route)³ (Buses in peak hour in peak direction)					
Multi	Undivided	No	No	-25%		Sidewalk Coverage	B	C	D	E	
-	-	-	Yes	+ 15%		0-84%	>5	≥4	≥3	≥2	
One-Way Facility Adjustment Multiply the corresponding two-directional volumes in this table by 0.6.						85-100%	>4	≥3	≥2	≥1	

¹ Values shown are presented as hourly two-way volumes for levels of service and are for the automobile/truck modes unless specifically stated. Although presented as peak hour two-way volumes, they actually represent peak hour peak direction conditions with an applicable D factor applied. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual, Bicycle LOS Model, Pedestrian LOS Model and Transit Capacity and Quality of Service Manual, respectively for the automobile/truck, bicycle, pedestrian and bus modes.

² Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

³ Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* For oversaturated conditions during peak hour, subtract 10% from the LOS E (capacity volumes). This number becomes the new maximum service volume for LOS D, and LOS E cannot be achieved.

** Cannot be achieved using table input value defaults.

*** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:

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