Introduction and Study Parameters

Introduction

This report presents an analysis of the potential transportation impacts that would be associated with development of the proposed Costco on the east side Airport Park Boulevard approximately one-half of a mile south of Talmage Road in the City of Ukiah. The study was completed in accordance with criteria established by the City of Ukiah and the California Department of Transportation (Caltrans), and is consistent with standard traffic engineering techniques. The project's potential effects on key intersections, US 101, pedestrian and bicycle circulation, and transit facilities were assessed, and measures necessary to mitigate potentially significant impacts identified.

The transportation analysis was prepared for the following background traffic scenarios:

- Existing
- Baseline
- Future

Project-generated trips were added to the Existing, Baseline and Future volumes to evaluate the following scenarios:

- Existing plus Project Buildout
- Baseline plus Project Buildout
- Future plus Project Buildout

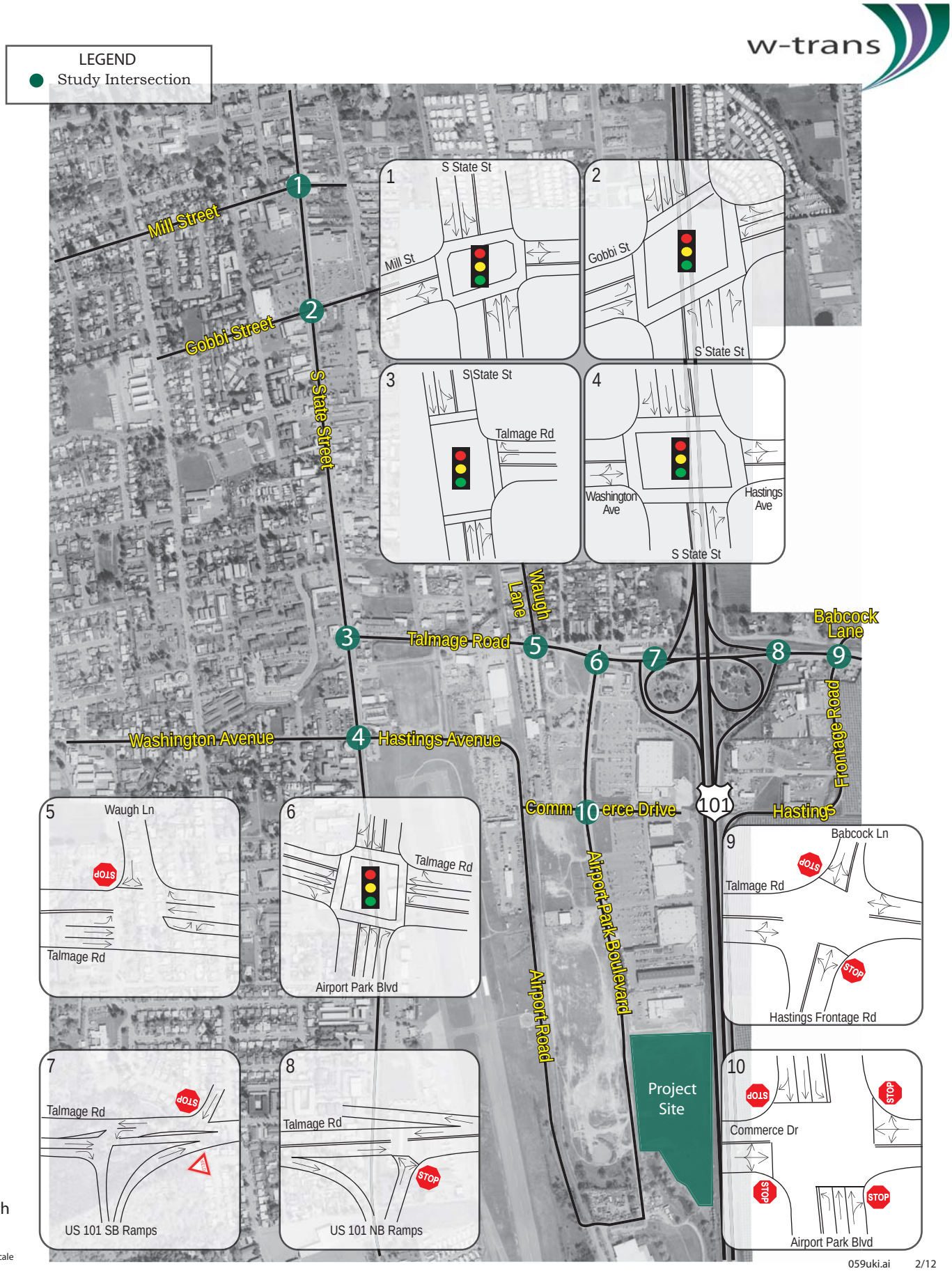
Project Profile

The proposed project would consist of a new 148,000 square foot Costco Wholesale warehouse with a tire center, a food court and a Costco fuel station that includes 16 fueling stations with the potential to expand to 20 fueling stations. The 15.33-acre project site is currently vacant and is located on the east side of Airport Park Boulevard between the existing Ken Fowler Auto Center and the Mendocino Brewing Company.

Study Area

The proposed project is located on the west side of US 101 south of Talmage Road (SR 222) and Commerce Drive. The project property is within the Redwood Business Park on Airport Park Boulevard. The adjacent parcels to the north are currently developed as a unified shopping center including Walmart, FoodMaxx, Staples, Friedman's Home Improvement Center and a number of small to medium sized retail stores, restaurants and a gas station. Several hotels, a Starbucks coffee shop, a bank and other services are located on the opposite side of Airport Park Boulevard. The shopping center and adjacent commercial uses are a destination for local shoppers from within the community as well as those from throughout the greater region since the nearest similar shopping opportunities are in Eureka to the north and Windsor to the south.

The project is located amongst a mix of transportation resources that provide local and regional access to the site including US Route 101 and the Talmage Road (State Route 222) interchange, regional and local streets, bike lanes, sidewalks and transit. The local circulation system serving the project site is shown in Figure 1. Primary access to the Costco project site would be via two new access points on Airport Park Boulevard, while secondary access driveways are proposed on the existing roadway that provides access to Ken Fowler Auto Center.



Costco DEIR Traffic & Circulation Report
City of Ukiah

Figure 1
Lane Configurations

US Route101 is the primary route connecting the City of Ukiah to the City of Santa Rosa and the San Francisco Bay Area to the south and Mendocino County to the north. Within Ukiah, US 101 is a four-lane freeway with interchanges at Talmage Road (SR 222), Gobbi Street and Perkins Street.

Talmage Road-State Route (SR) 222 is a major arterial with a highway interchange along the eastern City Limits, and provides a direct connection between South State Street and US 101, a regional corridor. Talmage Road-SR 222 is a Caltrans facility between the railroad crossing (west of Airport Park Boulevard) and the community of Talmage to the east of US 101.

Airport Park Boulevard extends from just north of Talmage Road along the project frontage to its terminus approximately three-quarters of a mile south of Talmage Road. North of Talmage Road, Airport Park Boulevard connects to residential streets that eventually intersect with Gobbi Street and Perkins Street. The southern terminus of Airport Park Boulevard intersects Airport Road, which ultimately intersects South State Street via Hastings Road. Airport Park Boulevard provides primary access to the project site. Along the project frontage, it has two travel lanes in each direction separated by planted medians and/or intermittent left turn lanes.

South State Street is designated as an arterial street in the Ukiah Valley General Plan. Within the City Limits, this roadway is generally a four-lane street that runs north-south and parallel to the US 101. The posted speed limit on South State Street ranges from 35 miles per hour (mph) south of Talmage Road (SR 222), to 30 mph between Talmage Road (SR 222) and Gobbi Street, and 25 mph north of Gobbi Street. Curbs, gutters and sidewalks exist along both sides of the street.

Hastings Avenue-Airport Road runs along the northern and eastern side of the Airport and connects South State Street to Airport Park Boulevard at the intersection with Commerce Drive. This street includes two lanes, on-street bicycle lanes on both sides of the street, and sidewalks on the northeastern side of the street. The southern terminus of Airport Road connects to Airport Park Boulevard.

Gobbi Street is a major arterial that provides a connection between South State Street and US 101 and has a highway interchange. Gobbi Street is a three-lane street with a two-way left-turn lane separating the east-west travel lanes. Sidewalks and bike lanes exists along both sides of Gobbi Street.

Mill Street, west of South State Street, is primarily a residential road with one lane in each direction with parking, curb, gutter and sidewalks on both sides of the street. This segment of Mill Street has a posted speed limit of 25 mph. Mill Street east of South State Street provides a connection to Main Street, where it currently terminates.

Waugh Lane is a narrow north-south collector street that connects Gobbi Street and Talmage Road (SR 222). This two-way street does not have centerline striping, sidewalks or bike lanes. The posted speed limit is 25 mph.

The following ten study intersections selected for analysis are shown in Figure 1. The controlling jurisdiction (if not the City of Ukiah), is indicated in parentheses.

1. South State Street/Mill Street
2. South State Street/Gobbi Street
3. South State Street/Talmage Road-SR 222 (Caltrans)
4. South State Street/Hastings Avenue-Airport Road
5. Talmage Road-SR 222/Waugh Lane (Caltrans)
6. Talmage Road-SR 222/Airport Park Boulevard (Caltrans)
7. Talmage Road-SR 222/US 101 South Ramps (Caltrans)
8. Talmage Road-SR 222/US 101 North Ramps (Caltrans)

9. Talmage Road-SR 222/Hastings Frontage Road-Babcock Lane (Caltrans)
10. Airport Park Boulevard/Commerce Drive

Segments of US 101 to the north and south of the Talmage Road (SR 222) interchange were evaluated.

Study Peak Periods

The traffic analysis was focused on weekday a.m. and p.m. peak hours, which represent the two typical weekday peak hours. The weekday a.m. and p.m. peak hours are the highest volume hours between 7:00 and 9:00 a.m. and 4:00 and 6:00 p.m. respectively.

Traffic counts during the Saturday midday peak were previously collected at the intersection of Talmage Road/Airport Park Boulevard to determine the extent of the potential project impacts during the Saturday midday peak. Traffic volumes during the Saturday peak were approximately 31 percent lower than those during the weekday p.m. peak hour. Potential impacts of the project on Saturdays are discussed in subsequent sections of this report, but a full quantitative analysis for Saturday conditions were not completed.

Intersection Analysis

Level of Service Methodologies

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersections were analyzed using methodologies published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2000. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle.

The ranges of delay associated with the various intersection Levels of Service are indicated in Table 1.

Table 1
Intersection Level of Service Criteria

LOS	Two-Way Stop-Controlled	All-Way Stop-Controlled	Signalized
A	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.	Delay of 0 to 10 seconds. Upon stopping, drivers are immediately able to proceed.	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
B	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.	Delay of 10 to 15 seconds. Drivers may wait for one or two vehicles to clear the intersection before proceeding from a stop.	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
C	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.	Delay of 15 to 25 seconds. Drivers will enter a queue of one or two vehicles on the same approach, and wait for vehicle to clear from one or more approaches prior to entering the intersection.	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
D	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.	Delay of 25 to 35 seconds. Queues of more than two vehicles are encountered on one or more approaches.	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
E	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side street.	Delay of 35 to 50 seconds. Longer queues are encountered on more than one approach to the intersection.	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
F	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.	Delay of more than 50 seconds. Drivers enter long queues on all approaches.	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual,* Transportation Research Board, 2000.

Analysis of Two-Way Stop-Controlled Intersections

The intersections of Talmage Road-SR 222/Waugh Lane, Talmage Road-SR 222/US 101 South Ramps, Talmage Road-SR 222/US 101 North Ramps and Talmage Road-SR 222/Hastings Frontage Road-Babcock Lane, which have one or two approaches stop controlled, were analyzed using the "Two-Way Stop-Controlled" intersection capacity method from the HCM. This methodology determines a level of service for each minor turning movement by estimating the level of average delay in seconds per vehicle. Results are presented for individual movements together with the weighted overall average delay for the intersection.

Analysis of All-Way Stop-Controlled Intersections

The intersection of Airport Park Boulevard/Commerce Drive, which is the only intersection controlled by all-way stop controls, was analyzed using the "All-Way Stop-Controlled Intersection" methodology contained in the HCM. This methodology evaluates delay for each approach based on turning movements, opposing and conflicting traffic volumes, and the number of lanes. Average vehicle delay is computed for the intersection as a whole, and is then related to a Level of Service.

Analysis of Signalized Intersections

The intersections of South State Street/Mill Street, South State Street/Gobbi Street, South State Street/Talmage Road-SR 222, South State Street/Hastings Avenue-Airport Road and Talmage Road-SR

222/Airport Park Boulevard, which are currently controlled by traffic signals were evaluated using the signalized methodology from the HCM. This methodology is based on factors including traffic volumes, green time for each movement, phasing, whether or not the signals are coordinated, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology.

Level of Service Standards

The *Ukiah Valley General Plan and Growth Management Program* (1995) establishes the criteria for acceptable operation. Policy CT-16.2 states that, "*LOS D is the minimum acceptable LOS for state highways, freeways, expressways, arterials and collectors.*" All of the study intersections fall under this criterion. Based on discussions with the City of Ukiah it was determined that the level of service standard of LOS D would be applied to the overall intersection operation of stop-controlled intersections rather than individual movements or approaches of an intersection.

Traffic Signal Warrants

The point at which signalization should be considered as a mitigation measure was determined based on information contained in the *Manual on Uniform Traffic Control Devices* (MUTCD, California supplement), Federal Highway Administration, 2003. For the purposes of this study, Warrant 3, the Peak Hour volume warrant, which determines the need for traffic control based on the highest volume hour of the day, was used as an initial indication of traffic control needs. The use of this signal warrant is common practice for planning studies. Other warrants, which are more generally applicable to existing traffic issues, require collection of traffic volumes for the highest four or eight hours of the day, review of the collision history, and evaluation of the system surrounding the location.

Analysis of Interchange Area Queuing

Adverse queuing conditions can result in traffic impacts at closely spaced intersections, particularly at freeway interchanges where queues can potentially affect mainline freeway operation. For these reasons, an analysis of queuing was performed for the Talmage Road corridor between Waugh Lane and Hastings Frontage Road-Babcock Lane, including the intersections of Talmage Road at Airport Park Boulevard, US 101 Southbound Ramps and US 101 Northbound Ramps. The analysis was focused on the p.m. peak hour as this time period has the highest delays and the greatest potential for queuing impacts.

The projected vehicle queues were determined using the applied timing schemes in SIMTRAFFIC, which is a traffic simulation extension of SYNCHRO. SIMTRAFFIC generates random "seeding" of vehicles on the street network and then simulates how vehicles will flow through the system using the actual volumes, phasing, and timing developed in SYNCHRO. Because each SIMTRAFFIC run is unique, a series of six separate "runs" was used to develop queuing estimates. The maximum queues that occur for each lane in the six SIMTRAFFIC runs were averaged and are reported as the maximum queue. The signal phasing and storage lengths for each lane were obtained from Caltrans' construction plans. The timing schemes for baseline and future conditions were assumed to remain unchanged upon the addition of project-generated traffic. Queuing impacts were considered significant if the calculated 95th percentile queue lengths either exceeded the available or proposed storage lengths of a left-turn pocket or was projected to queue back into the next controlled intersection or mainline freeway or freeway ramp facility.

Analysis of US 101 Freeway

The freeway analysis methodology contained in Chapter 23 of the HCM, "Basic Freeway Segments," was used to determine levels of service on US 101. The method uses variables such as traffic volumes,

geometric configuration of the freeway (i.e., number of lanes, widths of lanes and shoulders), topography, the percentage of heavy vehicles, and free-flow speeds to determine LOS criteria including the "service flow rate." Service flow rates are indicative of the travel demand on a freeway facility and are measured in the number of passenger cars per hour per lane. The ranges of service flow rates associated with the various Levels of Service are presented in Table 2.

Table 2
Freeway Level of Service Criteria

Level of Service	Maximum Service Flow Rate
A	710 pc/h/ln
B	1,170 pc/h/ln
C	1,680 pc/h/ln
D	2,090 pc/h/ln
E	2,350 pc/h/ln
F	Greater than 2,350 pc/h/ln

Notes: pc/h/ln = passenger cars per hour per lane
Criteria are for a freeway with 65 mph free-flow speed
Source: *Caltrans Guide for the Preparation of Traffic Impact Studies, 2002*

Caltrans maintains a target LOS at the transition between LOS C and LOS D for freeway facilities, which translates to a service flow rate of approximately 1,680 passenger cars per hour per lane. Where an existing freeway is operating at less than the LOS C/D threshold an existing "measure of effectiveness" should be maintained. In determining whether a project would create an adverse impact to a freeway facility already operating at LOS E or F, the forecasted service flow rate was compared to ideal freeway capacity to establish a theoretical volume-to-capacity (v/c) ratio. The impact was considered cumulatively significant if the project would increase the freeway v/c ratio on a facility already operating at LOS E or F by 0.01 or more.

Traffic Volumes

Intersection vehicle turning movement volumes used in the analysis were collected in February of 2010. The existing intersection traffic volumes used in the analysis are shown in Figure 2.

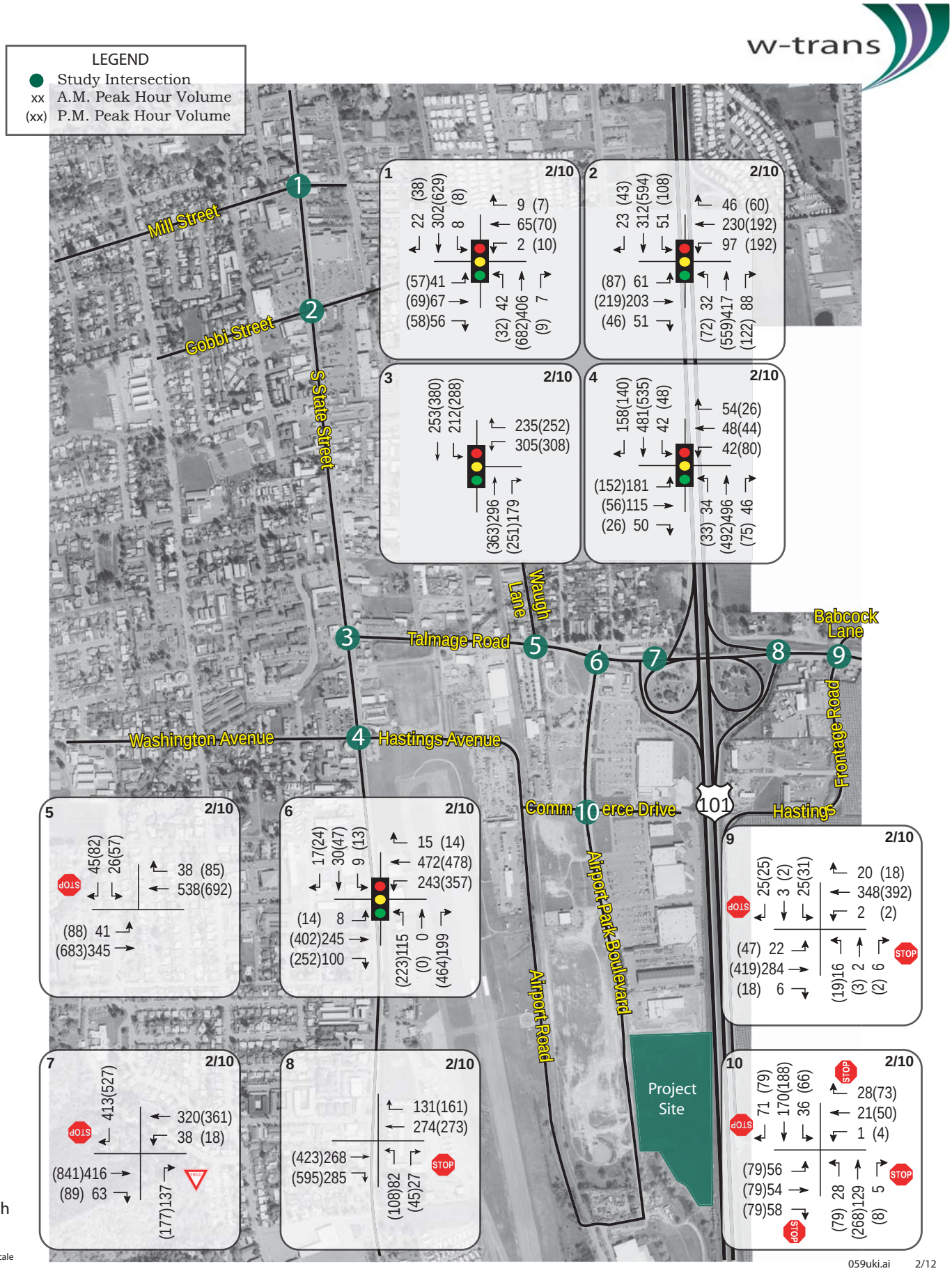
Traffic volumes for the US 101 freeway segments were obtained from the Caltrans "Traffic and Vehicle Data Systems Unit" internet site and reflect 2008 conditions.

Intersection Conditions

Levels of Service

All of the study intersections are currently operating acceptably at LOS D or better overall during both peak periods evaluated. It should be noted that even though the southbound right-turn lane at the intersection of Talmage Road/US 101 Southbound Ramps is currently operating at LOS E during the p.m. peak period, this intersection is operating at LOS A or B overall and therefore is considered to fall within acceptable levels of service.

The existing levels of service for each of the study intersections are summarized in Table 3. Level of service calculation sheets are provided in Appendix A.



Costco DEIR Traffic & Circulation Report
City of Ukiah

Figure 2
Existing Traffic Volumes

Table 3
Summary of Existing Level of Service Calculations

Intersection	**AM Peak Hour**		**PM Peak Hour**	
Minor Approach	**Delay**	**LOS**	**Delay**	**LOS**
1. South State St/Mill St	9.1	A	11.6	B
2. South State St/Gobbi St	24.6	C	35.9	D
3. South State St/Talmage Rd	22.5	C	29.9	C
4. South State St/Hastings Ave	34.1	C	22.2	C
5. Talmage Rd/Waugh Ln	1.3	A	2.6	A
Southbound Approach	*14.3*	*B*	*24.7*	*C*
6. Talmage Rd/Airport Park Blvd	18.9	B	27.1	C
7. Talmage Rd/US 101 SB Off-Ramp	7.5	A	13.0	B
Southbound Right-Turn	*19.1*	*C*	*36.4*	*E*
Northbound Right-Turn	*12.6*	*B*	*31.6*	*D*
8. Talmage Rd/US 101 NB Off-Ramp	2.2	A	3.0	A
Northbound Approach	*13.3*	*B*	*16.5*	*C*
9. Talmage Rd/Hastings Frontage Rd	1.9	A	2.5	A
Northbound Approach	*16.2*	*C*	*24.8*	*C*
Southbound Approach	*15.0*	*C*	*20.7*	*C*
10. Airport Park Blvd/Commerce Dr	9.2	A	11.0	B
US 101 Freeway Segments	**Northbound**		**Southbound**	
PM Peak Hour	**Vp**	**LOS**	**Vp**	**LOS**
North of Talmage Rd-SR 222	704	A	697	A
South of Talmage Rd-SR 222	372	A	368	A

Notes: Delay is in average seconds per vehicle; LOS = Level of Service; Vp = Service flow rate, measured in passenger cars per hour per lane

Interchange Area Queuing

Potential queuing interactions between the closely spaced intersections along the Talmage Road corridor from Airport Park Boulevard to east of US 101 Northbound Ramps were evaluated for both the a.m. and p.m. peak hours. Although both peak periods were analyzed, queuing results for only the p.m. peak hour are discussed below as this peak resulted in far worse queuing than a.m. peak conditions.

Under Existing p.m. peak hour conditions, the projected maximum queues between intersections and in turn pockets near the Talmage Road interchange are accommodated within the available storage except at one location. The US 101 Southbound Off-Ramp at Talmage Road is calculated to have maximum queues that extend beyond the available storage. A summary of the Existing p.m. peak hour queues is presented in Table 4. Copies of the SIMTRAFFIC Queuing Projections are contained in Appendix A.

Table 4
PM Peak Hour Queues Near Talmage Road-SR 222 Interchange – Existing

Intersection	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
6. Talmage Rd/Airport Park Blvd												
Available Storage	250	-	250	50	-	165	50	400	400	175	500	500
Maximum Queue	108	-	138	33	-	84	31	212	167	171	94	54
7. Talmage Rd/US 101 SB Off-Ramp												
Available Storage	-	-	1840	-	-	600	-	-	270	50	-	-
Maximum Queue	-	-	109	-	-	**728**	-	-	0	16	-	-
8. Talmage Rd/US 101 NB Off-Ramp												
Available Storage	930	-	-	-	-	-	-	-	-	-	-	-
Maximum Queue	113	-	-	-	-	-	-	-	-	-	-	-

Notes: Maximum Queue represents the actual maximum queues that develop within SIMTRAFFIC (values represent the average of 6 SIMTRAFFIC runs); All distances are measured in feet
Bold = movements where queues exceed available storage

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on the most recent available records from January 1, 2006, through December 31, 2010, obtained from the California Highway Patrol and published in their Statewide Integrated Traffic Records System (SWITRS) reports. As presented in Table 5, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2007 Accident Data on California State Highways*, California Department of Transportation.

Table 5
Collision Rates at the Study Intersections

Study Intersection	Number of Collisions (1/1/06-12/31/10)	Calculated Collision Rate (c/mve)	Statewide Average Collision Rate (c/mve)
1. South State St/Mill St	18	**0.55**	0.43
2. South State St/Gobbi St	8	0.18	0.43
3. South State St/Talmage Rd	13	**0.36**	0.28
4. South State St/Hastings Ave	4	0.12	0.43
5. Talmage Rd/Waugh Ln	6	0.18	0.22
6. Talmage Rd/Airport Park Blvd	9	0.20	0.43
7. Talmage Rd/US 101 SB Off-Ramp	2	0.05	0.14
8. Talmage Rd/US 101 NB Off-Ramp	1	0.03	0.14
9. Talmage Rd/Hastings Frontage Rd	3	0.16	0.22
10. Airport Park Blvd/Commerce Dr	5	0.24	0.41

Notes: c/mve = collisions per million vehicles entering; **Bold** = collision rates that exceed the statewide average for similar facilities

Two of the existing study intersections have experienced higher collision rates than the statewide averages, while eight intersections experienced lower than average rates. Copies of the collision calculation sheets are provided in Appendix B.

The intersection of South State Street/Mill Street has a collision rate for the five-year study period that is slightly higher than the Statewide average rate. The percentage of collisions that involved injuries was 55.6 percent, which is above the statewide average of 43.9 percent. Of the 18 collisions experienced at this intersection, eight were broadside collisions and six were rear-end collisions. With the high number of rear-end and broadside collisions there may be traffic signal timing and vehicle detection deficiencies which put drivers in a 'dilemma zone' when approaching this intersection. The City may wish to examine the traffic signal timing and detection system to ensure that this traffic signal is operating acceptably.

The intersection of South State Street/Talmage Road had a collision rate slightly higher than the Statewide average rate. The percentage of collisions that involved injuries was 46.2 percent, which is also slightly above the statewide average of 43.3 percent. Collisions at this intersection were primarily rear-end and collisions. The high incidence of rear-end crashes is fairly common at signalized locations, especially during periods of congestion. Efforts by the City to improve signal timing could be effective in addressing the rear-end collision pattern experienced at this study intersection.

Freeway Conditions

The segments of US 101 to the north and south of Talmage Road are currently operating at LOS A in both the northbound and southbound directions during the p.m. peak hour. The existing levels of service for the freeway segments are summarized in Table 3. Level of service calculation sheets for freeway segments are included in Appendix C.

Alternative Transportation Conditions

The Costco project site is located more than 0.75 mile from the nearest residential neighborhoods to the north and west of the site. Therefore, it is reasonable to assume that project patrons or employees are unlikely to walk to the site, since it is more than the typical desirable walking distance of 0.25 mile. However, some patrons or employees may walk from transit stops or bicycle to the project site.

Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signals, curb ramps, and streetscape amenities. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site; however, significant sidewalk gaps, obstacles, and barriers can be found along each of the roadways connecting to the project site. Existing gaps and obstacles along the connecting roadways impact convenient and continuous access for pedestrians and present safety concerns in those locations where appropriate pedestrian infrastructure would address potential conflict points. A summary description of existing pedestrian conditions is provided below.

- *Talmage Road* – Intermittent sidewalk coverage is provided on Talmage Road with significant gaps on one or both sides of the street between Hastings Frontage Road-Babcock Lane on the east side of US 101 and South State Street. Curb ramps and crosswalks at side street approaches are intermittent, non-existent, or not compliant with current ADA standards. High-speed movements associated with the Talmage Road/US 101 interchange are in conflict with pedestrian movements. Overhead streetlights provide lighting of the corridor.

- *Airport Park Boulevard* – There is intermittent sidewalk coverage on Airport Park Boulevard. Currently sidewalks do not exist on the east side of the street along the project frontage. Sidewalks are provided along the developed properties on the west side of the street between Talmage Road and Commerce Drive. South of Commerce Drive, limited sidewalk coverage is provided along developed property frontages. Marked crosswalks are not provided at the Airport Park Boulevard/ Commerce Drive intersection, and curb ramps are not in compliance with current ADA standards. Street lighting is not provided on Airport Park Boulevard.

- *Airport Road* – Continuous sidewalks exist on the north side of Airport Road between Commerce Drive and Hastings Avenue. Sidewalks are not provided on the south side of the street. There are no streetlights on this road.

- *Hastings Avenue* – Continuous sidewalks are provided on the north side of Hastings Avenue between Airport Road and approximately 275 feet east of South State Street. Sidewalks are not provided on the south side of the street. Hastings Avenue has no street lighting.

- *South State Street* – Sidewalks are generally provided on both sides of South State Street with intermittent gaps along undeveloped property frontages. Overhead streetlights provide lighting for the corridor.

- *Waugh Lane, Betty Street, Lorraine Street, and Henderson Lane* are all narrow local streets that provide access to residences on the north side of Talmage Road. Sidewalks and streetlights are generally not provided along these local streets.

Bicycle Facilities

The *2006 Mendocino County Bikeway Plan* identifies the following types of bikeways:

- *Class I* – These facilities are commonly referred to as "bike paths." They provide a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorists minimized.

- *Class II* – These facilities are commonly referred to as "bike lanes." They provide a restricted right-of-way designated for the exclusive or semi-exclusive use of bicycle traffic, with through travel by motor vehicles or pedestrians prohibited. Adjacent vehicle parking and cross flows by pedestrians and motorists are permitted.

- *Class III* – These facilities are commonly referred to as "bike routes." They are generally on-street facilities that provide right-of-way designated by signs and/or pavement markings and are shared with pedestrians and motorists.

In the project area, Class II bike lanes exist on Hastings Avenue between Airport Road and South State Street. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project study area.

The following bicycle and pedestrian improvements are listed as planned improvements in Ukiah's General Plan or Bicycle Master Plan. It should be noted that the planned improvements listed in Ukiah's General Plan or Bicycle Master Plan did not include specifics about the timing or funding for implementation of these projects.

- Planned Class III bike route on Talmage Road between South State Street and Ukiah's eastern city limit.

- Planned North Western Pacific Rail Trail (Class I pathway) along the rail corridor just west of the project site between Ford Road and Norgard Lane.

Transit Facilities

The Mendocino Transit Authority (MTA) provides fixed route bus service in Ukiah. MTA Local Route 9 provides loop service to destinations throughout the City and stops on Commerce Drive between Walmart and FoodMaxx. Stops on this route are within a reasonable walking distance to the project site. Route 9 operates Monday through Friday with approximately one-half hour headways between 7:00 a.m. and 8:30 p.m. Saturday service operates with approximately one-half hour headways between 10:00 a.m. and 5:00 p.m.

Routes 20, 21, and 30 provide inland service between Willits, the Redwood Valley, Calpella, and Ukiah. Each route stops on Commerce Drive between Walmart and FoodMaxx and operate Monday through Friday with approximately one to three hour headways between 8:00 a.m. and 5:30 p.m.

Route 75, the South Mendocino Coast Bus, provides service between Gualala, Fort Bragg, and Ukiah, with a stop on Commerce Drive between Walmart and FoodMaxx. Route 75 operates Monday through Saturday with northbound and southbound service in the morning and afternoon.

Two bikes can be carried on most MTA buses. Bike rack space is on a first come, first served basis. In Ukiah, bikes are not allowed on the bus south of downtown. Within Ukiah, bikes are not permitted south of School Street and Perkins Street on the Local #9. Based on discussions with MTA staff it was determined that bikes are actually allowed south of Downtown, School Street and Perkins Street with one specific restriction. Buses with the front loading bicycle racks in use have a difficult time negotiating the intersection of South State Street/Gobbi Street. Therefore, before buses access this intersection bus riders with bicycles on the front racks are asked to remove their bikes and ride to the next stop before re-boarding the bus.

Dial-a-ride, also known as paratransit, or door-to-door service, is available for those who are unable to independently use the transit system due to a physical or mental disability. MTA Paratransit is designed to serve the needs of individuals with disabilities within Ukiah and greater Mendocino County.

Local Regulations

Relevant policies from the City's General Plan are provided below.

2004 City of Ukiah General Plan

The Ukiah General Plan indicates that, "Developing bicycle and pedestrian paths as an attractive, integrated part of the transportation system can enhance the quality of life in the City and County. Easy to use paths, with convenient secured bicycle parking, and safe travel ways will encourage people to use bikes or walk on trips and errands." The following Goals, Policies, and Implementation Actions from the General Plan are relevant to the proposed project.

Goal CT-3: Design new development and redevelopment projects to be as accessible by foot, bicycle, and transit, as they are by auto

Policy Ct-3.1: New development and redevelopment projects shall specifically include plans for pedestrian facilities, bike lanes, bike racks, and transit stops.

Implementation CT-3.1(a): Working with the Mendocino Transit Authority and other appropriate agencies, the City and County shall include in the land development code a menu of options to facilitate and encourage alternative modes of travel and transportation.

Goal CT-6: Increase the use of bicycle transportation

Implementation CT-6.1(a): Utilize the Land Development Code to ensure that there is secure and safe parking for bicycles in new parking facilities.

Policy CT-6.2: Promote the use of bicycles as a viable and attractive alternative to cars.

Implementation CT-6.2(b): Provide incentives and technical support to encourage employers to provide convenient, safe, and secure bicycle parking at places of employment.

Policy CT-6.3: Provide bicycle lanes or paths along major streets.

Implementation CT-6.3(a): Require that streets linking residential areas with school facilities and shopping areas be designed to include bicycle lanes.

Implementation CT-6.3(b): Consider bicycle operating characteristics in the design of intersections and traffic control systems and include appropriate features in intersection design standards.

Goal CT-7: Develop pedestrian access

Policy CT-7.1: Treat pedestrian access as an integral part of all road improvements within the City and within urbanized development areas of the County.

Implementation CT-7.1(b): Pedestrian walkways shall be integrated and designed to provide direct access between areas.

Implementation CT-7.1(d): Pedestrian access shall be accessible to the handicapped with appropriate curb cuts, grades, and ramps.

Goal CT-8: Encourage increased use of public transportation

Policy CT-8.1: Make it easier to utilize bus service.

Implementation CT-8.1(d): The City and County shall work with MTA and Caltrans to ensure that project design maximizes potential sources of transit ridership through the use of shelters, passengers amenities, and service schedules.

Goal CT-9: Maximize the use of public transportation through efficient land use patterns and supporting incentive programs

Policy CT-9.1: Include design features in new commercial and residential areas that make public transportation convenient.

Implementation CT-9.1(b): As a part of project review for new development, seek comments and recommendations from the Mendocino Transit Authority concerning the agency's needs to better serve the project.

Implementation CT-9.1(d): No mitigation measures or project conditions shall exceed the direct relationship between the economic cost of the requirement measured against the project's actual impact.

Policy CT-9.2: Support a strategy to provide funding and incentives to increase ridership opportunities.

Implementation CT-9.2(a): Develop an overall strategy to mitigate traffic and air quality impacts from new development which cannot directly be served by public transit. Consider a range of alternatives designed to encourage people to use alternatives to the automobile. These programs may include, and are not limited to, incentives for public transit ridership, or construction of nearby or convenient bus stops.

Roadway Improvements

Planned Intersection Improvements

At the time of this report, the City of Ukiah is in the process of designing treatments to improve traffic operations at intersections #4, South State Street/Hastings Avenue-Airport Road, and #11, Airport Park Boulevard/Commerce Drive.

Following is a description of the improvements that are being designed.

- Intersection #4 – *South State Street/Hastings Avenue-Airport Road*: The intersection will be reconfigured to provide a left-turn lane on the westbound Hastings Avenue approach. Based on information provided by Public Works construction of this planned improvement is expected to begin in 2012 or 2013. Therefore, this planned improvement was included in the traffic analysis of Baseline and Future conditions.

- Intersection #11 – *Airport Park Boulevard/Commerce Drive:* Installation of a traffic signal is planned. The lane configuration at this signalized intersection will remain the same as under Existing conditions. Construction of this planned improvement is expected to begin in 2012 or 2013. Therefore, this planned improvement was included in the traffic analysis of Baseline and Future conditions.

Originally, modifications to Talmage Road at the intersections with Airport Park Boulevard and the US 101 SB Ramps were planned. However, previous analysis from the *Walmart Expansion DEIR Traffic & Circulation* report determined that the original planned intersection improvements would not mitigate the project traffic impacts to an acceptable level. Although the subject Walmart Expansion project was not approved, this report was still used as a reference and therefore, these improvements were not included in the analysis.

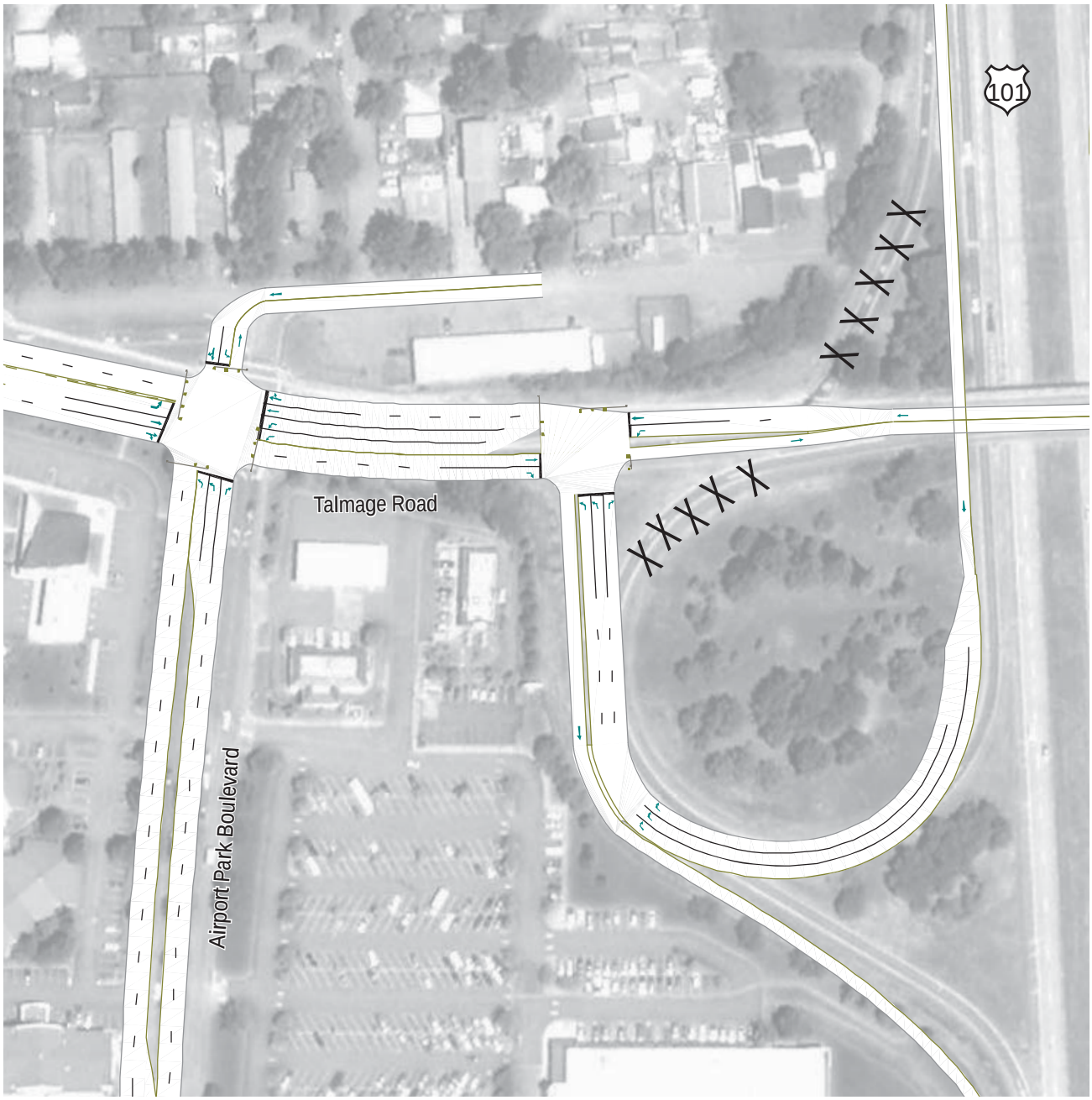
Talmage Road Interchange

The *Walmart Expansion DEIR Traffic & Circulation* report included an assessment of potential interchange modification alternatives to accommodate existing deficiencies and increased traffic at the Talmage Road interchange. Two alternatives were presented for the southbound ramp intersection; however, since the Walmart Expansion project was not approved, no mitigation measures were officially adopted. For the purpose of this study though, the traffic signal alternative presented in the Walmart report was used as a basis for determining necessary improvements with appropriate modification, if needed. It should be noted that the roundabout alternative presented in the *Walmart Expansion DEIR Traffic & Circulation* report was not incorporated into this analysis.

The interchange improvements considered in this previous study includes the closure of the existing stop-controlled US 101 Southbound Off-Ramp right-turn to westbound Talmage Road. All US 101 Southbound Off-Ramp traffic would be redirected to access Talmage Road via a new full access intersection where the current loop ramp connects with Talmage Road so that all off-ramp traffic would utilize the off-loop ramp. The existing US 101 Southbound Off-Ramp loop would be reconfigured to a more standard 90-degree angle. Under this mitigation, the intersection of the loop ramp with Talmage Road would be controlled by a traffic signal. Both the eastbound Talmage Road and northbound US 101 Southbound Off-Ramp right-turn lanes will have right-turn overlap phasing, while the westbound Talmage Road approach would include protected left-turn phasing. This mitigation would allow the existing two-lane Talmage Road overcrossing to be maintained.

The design would also provide for two left-turn lanes on the westbound Talmage Road approach to Airport Park Boulevard, which should extend the entire distance to the adjacent intersection. Since the left-turn lanes would extend all the way to the intersection, it is important that signs and markings on the

off-ramp are provided to direct drivers to the correct lane for their destination. Further, intersection markings should be incorporated that provide guidance so that not to create a trap-lane situation for drivers in the far northbound left lane. In order to avoid unacceptable vehicle queuing on eastbound Talmage Road between Airport Park Boulevard and US 101 Southbound Ramps, it would be necessary to remove the existing northbound right-turn overlap phasing at Airport Park Boulevard/Talmage Road. This change may appear counterintuitive to improving operations, but the purpose of the change is to meter vehicles enter the segment, and instead use the space on northbound Airport Park Boulevard where more queuing space is available.



North

Not to Scale

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Costco DEIR Traffic & Circulation Report

City of Ukiah

Figure 3A

Talmage Road Interchange Option A

Baseline Traffic Scenario

The Baseline traffic scenario represents a near-term horizon of the end of 2013 or 2014, when the proposed Project would be completed. This scenario reflect conditions with traffic from projects that the City deems likely to be constructed and generating traffic by this horizon year. For the purposes of this analysis, the following projects affecting the study area were included in the Baseline scenario.

- The Branches Wood Fired Chop House, a 12,295 square foot quality restaurant which opened at the end of 2010, is located on the northwestern corner of Airport Park Boulevard/Commerce Drive-Hastings Avenue and is within the Airport Business Park.

- The Arco AM/PM Market site is located approximately 0.75 miles northeast of Costco, occupying the currently developed but vacant building located on the southwest corner of Talmage Road/ Hastings Frontage Road-Babcock Lane. Buildout of the proposed project would allow development of 3,000 square feet of convenience market space with a six-vehicle fueling position gas station. The Arco AM/PM Market project has been approved by the City.

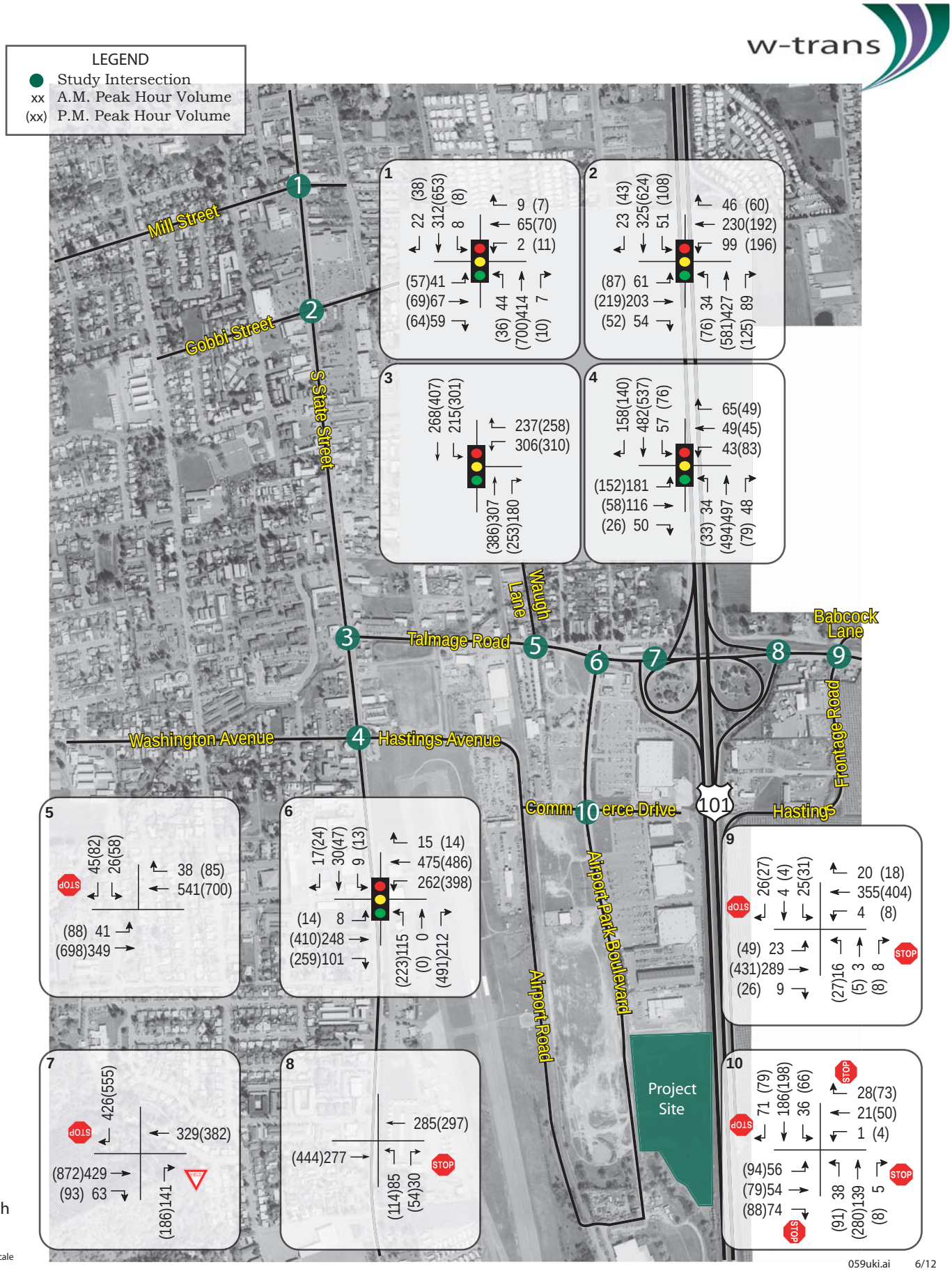
- The Guillon project has been approved by the City, and is sited on the west side of Airport Park Boulevard south of Commerce Drive-Hastings Avenue, within the Airport Business Park. This project includes up to 16,000 square feet of retail and commercial space.

- The Kunzler Terrace Mine project site is located approximately three miles northeast of Costco, and will add minimal vehicle traffic to the US 101 ramp intersections on Talmage Road.

The traffic associated with these projects was added to existing traffic volumes in order to obtain Baseline volumes. The Baseline Traffic Volumes, which do not include trips associated with the proposed Costco project, are presented in Figure 4. Baseline traffic volume projections for US 101 were developed by adding the traffic volumes associated with the four Baseline projects to existing 2008 volumes collected by W-Trans.

Intersection Conditions

With Baseline traffic volumes, all of the study intersections are projected to continue operating at acceptable levels of service. These LOS results are summarized in Table 6. As shown in Table 6, conditions for intersection #4, South State Street/Hastings Avenue-Airport Road and intersection #10, Airport Park Boulevard/Commerce Drive include the City's planned improvements.



Costco DEIR Traffic & Circulation Report
City of Ukiah

Figure 4
Baseline Traffic Volumes

Table 6
Summary of Baseline Level of Service Calculations

Intersection	AM Peak Hour		PM Peak Hour	
Minor Approach	**Delay**	**LOS**	**Delay**	**LOS**
1. South State St/Mill St	9.2	A	12.0	B
2. South State St/Gobbi St	25.0	C	37.1	D
3. South State St/Talmage Rd	23.2	C	32.0	C
4. South State St/Hastings Ave*	34.0	C	24.6	C
5. Talmage Rd/Waugh Ln	1.3	A	2.6	A
Southbound Approach	*14.4*	*B*	*25.4*	*D*
6. Talmage Rd/Airport Park Blvd	19.2	B	28.9	C
With Two WB Left-Turn Lanes	22.1	C	27.7	C
7. Talmage Rd/US 101 Southbound Off-Ramp	7.9	A	17.2	C
Southbound Right-Turn	*20.4*	*C*	*49.1*	*E*
Northbound Right-Turn	*12.8*	*B*	*37.5*	*E*
Interchange Alternative – (Traffic Signal)	21.0	C	22.6	C
8. Talmage Rd/US 101 Northbound Off-Ramp	2.3	A	3.3	A
Northbound Approach	*13.6*	*B*	*17.9*	*C*
9. Talmage Rd/Hastings Frontage Rd	2.1	A	3.2	A
Northbound Approach	*16.8*	*C*	*26.9*	*D*
Southbound Approach	*15.5*	*C*	*22.9*	*C*
10. Airport Park Blvd/Commerce Dr*	5.8	A	6.8	A
US 101 Freeway Segments	**Northbound**		**Southbound**	
PM Peak Hour	**Vp**	**LOS**	**Vp**	**LOS**
North of Talmage Rd-SR 222	718	B	716	B
South of Talmage Rd-SR 222	380	A	375	A

Notes: Delay is in average seconds per vehicle; LOS = Level of Service; * = Includes planned improvements; Vp = Service flow rate, measured in passenger cars per hour per lane

Interchange Area Queuing

Under Baseline p.m. peak hour conditions, the projected maximum queues between intersections and in turn pockets near the Talmage Road interchange can be accommodated within the available storage except at two locations. The westbound Talmage Road left-turn lanes at Airport Park Boulevard are projected to have maximum queues that extend beyond the available storage. Also, the US 101 Southbound Off-Ramp at Talmage Road is projected to have maximum queues that extend well beyond the available storage. A summary of the Baseline p.m. peak hour queues is presented in Table 7. Copies of the SIMTRAFFIC Queuing Projections are contained in Appendix A.

Table 7
PM Peak Hour Queues Near Talmage Road-SR 222 Interchange – Baseline

Intersection	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
6. Talmage Rd/Airport Park Blvd												
Available Storage	250	-	250	50	-	165	50	400	400	175	500	500
Maximum Queue	97	-	149	19	-	78	50	233	215	**209**	82	62
With Two WB Left-Turn Lanes												
Available Storage	250	-	250	50	-	165	50	400	400	285	285	285
Maximum Queue	120	-	104	35	-	91	26	192	176	182	146	101
7. Talmage Rd/US 101 SB Off-Ramp												
Available Storage	-	-	1840	-	-	600	-	-	270	50	-	-
Maximum Queue	-	-	104	-	-	**1078**	-	-	0	31	-	-
Interchange Alternative – (Traffic Signal)												
Available Storage	900	-	900	-	-	-	-	285	285	260	940	-
Maximum Queue	257	-	102	-	-	-	-	251	236	44	135	-
8. Talmage Rd/US 101 NB Off-Ramp												
Available Storage	930	-	-	-	-	-	-	-	-	-	-	-
Maximum Queue	116	-	-	-	-	-	-	-	-	-	-	-

Notes: Maximum Queue represents the actual maximum queues that develop within SIMTRAFFIC (values represent the average of 6 SIMTRAFFIC runs); All distances are measured in feet; **Bold** = movements where queues exceed available storage

Finding A: Under Baseline conditions, unacceptable queuing is expected to occur in the westbound left-turn lane at Talmage Road/Airport Park Boulevard.

Recommendation A: Two left-turn lanes approach should be installed on the westbound Talmage Road approach to Airport Park Boulevard. In order to operate acceptably, these improvements need to be accompanied by the improvements involving the southbound off-ramp previously discussed.

Finding B: Under Baseline conditions, traffic volumes and operations contribute to inadequate queuing storage in the southbound approach of the freeway off-ramp at the intersection of Talmage Road/US 101 Southbound Off-Ramp. The Peak Hour Volume traffic signal warrant would be met

Recommendation B: Implementation of the Talmage Road Interchange Improvements previously discussed will result in acceptable queuing conditions at Talmage Road/US 101 Southbound Off-Ramp.

Freeway Conditions

The segments of US 101 both to the north and to the south of Talmage Road (SR 222) are projected to operate acceptably at LOS A or B under Baseline Conditions. The LOS results are summarized in Table 6 and calculation sheets are provided in Appendix C.

Future Background Traffic Projections

The Ukiah Valley Area Plan (UVAP) travel demand forecasting model was used as the basis for the Future 2030 traffic conditions. Based on discussions and direction from MCOG staff, the "2030 No Project with 2007 Network (no improvements)" scenario was used as the basis for determining future traffic projections. The 2030 No Project with improvements presumes the completion of certain road projects that are not all funded or universally agreed-upon. Therefore, the Existing Network condition was selected since it represents a worst-case scenario.

The City provided a land use inventory for the area bounded by Talmage Road, US 101 and the airport property. This data indicated that there is currently 640,418 square feet of developed floor space and 464,872 square feet of potential development floor space in the Redwood Business Park area. These estimates by the City were based on actual development and the current lot coverage applied to the vacant parcels. In examining the UVAP model land use assumptions, it was determined that the model included an estimated 797,000 square feet of developed floor space for the base condition (2007) and 569,000 square feet of potential development in the subject area. These estimates were based on the full zoning of all the parcels in the business park possibly without consideration for constraints such as parking requirements, landscaping, setbacks, etc. Therefore, the UVAP model may have overestimated traffic volume increases generated within the Redwood Business Park area by approximately 22 percent. For the purpose of this study, the Future background traffic volumes were adjusted to create a condition where the Costco project site was vacant. Therefore, trips which were assumed to be generated by the site in the UVAP model were removed from the Future volumes. It should also be noted that the previously proposed Walmart expansion was not included in these Future Traffic projections.

Two conditions were considered for the future analysis:

- "Future with Current Redwood Business Park Growth" – This future scenario is consistent with the City's estimates and presumes that all vacant parcels will be developed with a lot coverage ratio similar to other development in the business park.

- "Future with Fully Zoned Redwood Business Park" – This scenario is consistent with the assumption from the UVAP model and includes the full development potential for the remaining undeveloped parcels.

Based on historical trends and constraints including parking requirements, landscaping, building setbacks, etc, the City has determined that the remaining parcels are likely to be developed with intensities similar to or lower than the current uses. Since the traffic analysis includes other layers of conservative assumptions, including the project trip generation, it was determined that the "Future with Fully Zoned Redwood Business Park" scenario would result in unrealistically high traffic volumes. Also, based on earlier sensitivity analyses, both of these scenarios are going to require similar mitigation measures at the Talmage Road interchange. Therefore, based on discussions of these issues with City staff, only the "Future with Current Redwood Business Park Growth" scenario, which is referred to as "Future" was presented for this traffic study.

Future Conditions

The following process was used to estimate intersection turning movement projections for the Future scenarios while also considering the overestimate of land use by the UVAP model:

- Future growth in traffic was determined by taking the difference between the UVAP 2030 condition and the 2007 base year on a link segment basis.

- The growth increment was converted to intersection turning movements using the existing turning movements as a guideline for the distribution of traffic.

- The growth increment turning movements were then reduced by an appropriate volume of traffic to reflect the City's lower estimate of 464,872 square feet of potential development in the Redwood Business Park compared with the UVAP model estimate.

- The adjusted growth increment volumes were then added back to the existing turning movements to represent the Future conditions.

Intersection Traffic Volumes

The applied Future traffic volumes are shown in Figure 5.

Future Intersection Lane Configurations

The future 2030 lane configurations were assumed to be the same as Existing conditions. Conditions with the planned intersection improvements were also evaluated.

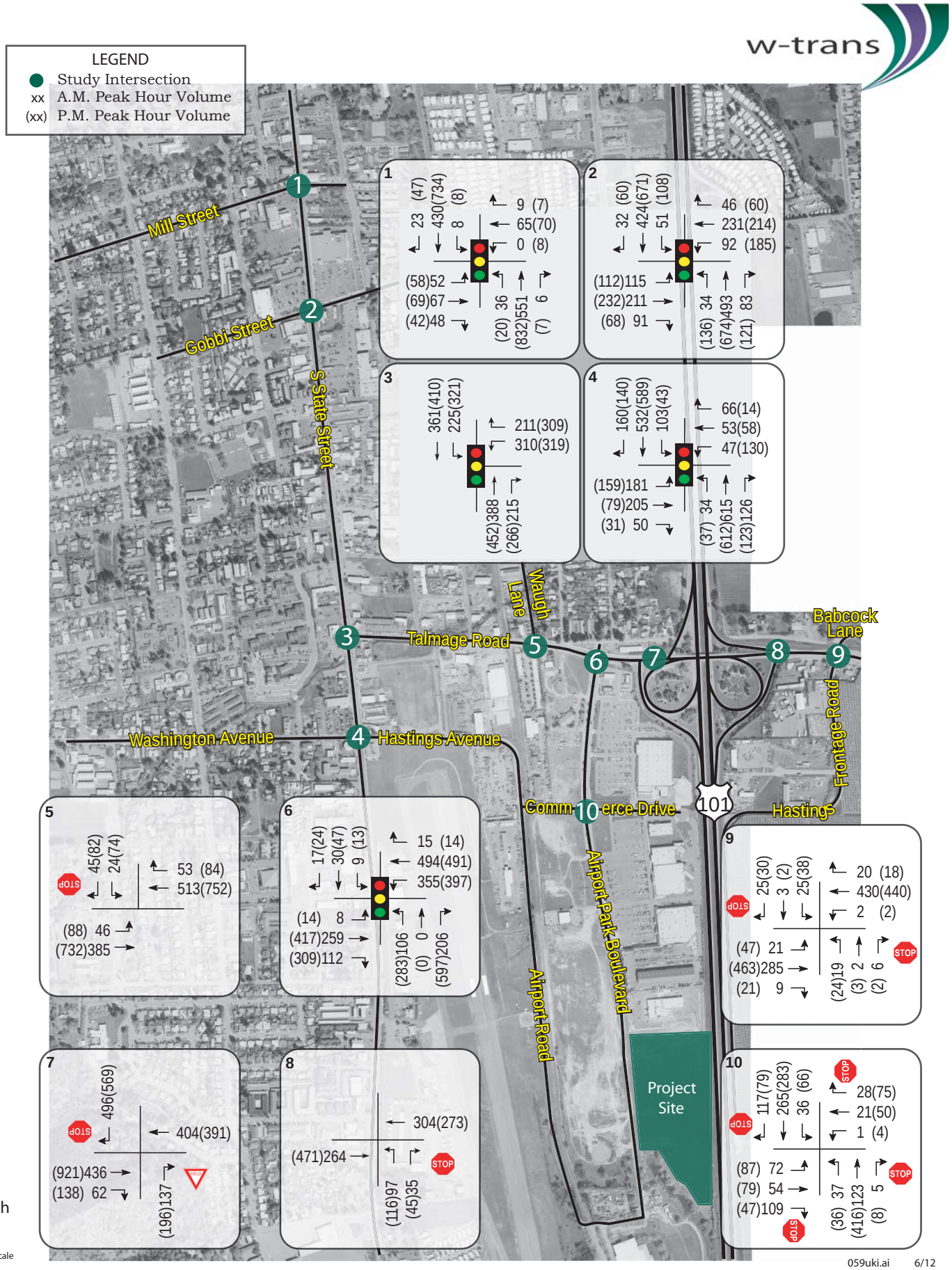
Freeway Volumes

Future traffic volume projections for US 101 were obtained from the UVAP model.

Future Traffic Operations

Intersection Conditions

With Future traffic volumes, all of the study intersections are projected to continue operating at acceptable levels of service. A summary of the Future Level of Service results is presented in Table 8. As shown in Table 8, conditions for intersection #4, South State Street/Hastings Avenue-Airport Road, and intersection #10, Airport Park Boulevard/Commerce Drive, include the City's planned improvements. Although the Southbound US 101 Off-Ramp at Talmage Road was identified as having individual movements that would operate at LOS F, the overall intersection is expected to operate acceptably at LOS B or C.



Costco DEIR Traffic & Circulation Report
City of Ukiah

Figure 5
Future Traffic Volumes

Table 8
Summary of Future LOS Calculations

Intersection	AM Peak Hour		PM Peak Hour	
Minor Approach	**Delay**	**LOS**	**Delay**	**LOS**
1. South State St/Mill St	10.4	B	13.0	B
2. South State St/Gobbi St	25.5	C	42.8	D
3. South State St/Talmage Rd	24.4	C	28.9	C
4. South State St/Hastings Avenue*	47.0	D	25.0	C
5. Talmage Rd/Waugh Ln	1.3	A	3.0	A
Southbound Approach	*13.6*	*B*	*29.2*	*D*
6. Talmage Rd/Airport Park Blvd	19.2	C	29.2	C
With Two WB Left-Turn Lanes	25.5	C	29.1	C
7. Talmage Rd/US 101 SB Off-Ramp	12.1	B	16.8	C
Southbound Right-Turn	*32.5*	*D*	*46.9*	*E*
Northbound Right-Turn	*12.6*	*B*	*41.8*	*E*
Interchange Alternative – (Traffic Signal)	15.1	B	23.9	C
8. Talmage Rd/US 101 NB Off-Ramp	2.6	A	3.1	A
Northbound Approach	*13.6*	*B*	*17.6*	*C*
9. Talmage Rd/Hastings Frontage Rd	1.9	A	2.9	A
Northbound Approach	*17.7*	*C*	*28.7*	*D*
Southbound Approach	*16.1*	*C*	*23.8*	*C*
10. Airport Park Blvd/Commerce Dr*	6.3	A	6.4	A
US 101 Freeway Segments	**Northbound**		**Southbound**	
PM Peak Hour	**Vp**	**LOS**	**Vp**	**LOS**
North of Talmage Rd-SR 222	696	A	949	B
South of Talmage Rd-SR 222	541	A	616	A

Notes: Delay is in average seconds per vehicle; LOS = Level of Service; * = Includes planned improvements; Vp = Service flow rate, measured in passenger cars per hour per lane

Interchange Area Queuing

Under Future p.m. peak hour conditions, the projected maximum queues between intersections and in turn pockets near the Talmage Road interchange can be accommodated within the available storage except at two locations. The westbound Talmage Road left-turn lanes at Airport Park Boulevard are both projected to have maximum queues that extend beyond the available storage. Also, the US 101 Southbound Off-Ramp at Talmage Road is projected to have maximum queues that extend well beyond the available storage.

A summary of the Future p.m. peak hour queues is presented in Table 9. Copies of the SIMTRAFFIC Queuing Projections are contained in Appendix A.

Table 9
PM Peak Hour Queues Near Talmage Road-SR 222 Interchange – Future Conditions

Intersection	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
6. Talmage Rd/Airport Park Blvd												
Available Storage	250	-	250	50	-	165	50	400	400	175	500	500
Maximum Queue	113	-	235	43	-	72	22	291	266	**184**	98	63
With Two WB Left-Turn Lanes												
Available Storage	250	-	250	50	-	165	50	400	400	285	285	285
Maximum Queue	156	-	236	35	-	78	30	261	286	191	199	148
7. Talmage Rd/US 101 SB Off-Ramp												
Available Storage	-	-	1840	-	-	600	-	-	270	50	-	-
Maximum Queue	-	-	228	-	-	**1161**	-	-	4	26	-	-
Interchange Alternative – (Traffic Signal)												
Available Storage	900	-	900	-	-	-	-	285	285	260	940	-
Maximum Queue	248	-	113	-	-	-	-	259	256	40	136	-
8. Talmage Rd/US 101 NB Off-Ramp												
Available Storage	930	-	-	-	-	-	-	-	-	-	-	-
Maximum Queue	59	-	-	-	-	-	-	-	-	-	-	-

Notes: Maximum Queue represents the actual maximum queues that develop within SIMTRAFFIC (values represent the average of 6 SIMTRAFFIC runs); All distances are measured in feet
Bold = movements where queues exceed available storage

Finding C: Under Future conditions, unacceptable queuing is expected to occur in the westbound left-turn lane at Talmage Road/Airport Park Boulevard.

Recommendation C: See Recommendation A.

Finding D: Under Future conditions, traffic volumes and operations contribute to inadequate queuing storage in the southbound approach of the freeway off-ramp at the intersection of Talmage Road/US 101 Southbound Off-Ramp. The Peak Hour Volume traffic signal warrant would be met.

Recommendation D: Implementation of the realignment and signalization of the intersection would result in acceptable queuing conditions at Talmage Road/US 101 Southbound Off-Ramp.

Freeway Conditions

The segments of US 101 both to the north and to the south of Talmage Road (SR 222) are projected to operate acceptably at LOS A or B under Future Conditions. The LOS results are summarized in Table 8 and calculation sheets are provided in Appendix C.

Significance Criteria

The applied thresholds of significance for impacts associated with the proposed development are based on those included in the City of Ukiah's General Plan, Caltrans Guide for the Preparation of Traffic Impact Studies as well as criteria contained in the California Environmental Quality Act (CEQA) Guidelines.

The Project would create a significant circulation impact if it would:

- The Ukiah Valley General Plan and Growth Management Program (1995) establishes the criteria for acceptable operation. Policy CT-16.2 states that, "*LOS D is the minimum acceptable LOS for state highways, freeways, expressways, arterials and collectors*." All of the study intersections fall under this criterion. Based on discussions with the City of Ukiah it was determined that the level of service standard of LOS D would be applied to the overall intersection operation of stop-controlled intersections rather than individual movements or approaches of an intersection.

- Caltrans maintains a target LOS at the transition between LOS C and LOS D for freeway facilities, which translates to a service flow rate of approximately 1,680 passenger cars per hour per lane. Where an existing freeway segment is operating at less than the LOS C/D threshold the existing "measure of effectiveness" should be maintained. In determining whether a project would create an adverse impact to a freeway facility already operating at LOS E or F, the forecast service flow rate was compared to ideal freeway capacity to establish a theoretical volume-to-capacity (v/c) ratio. A significant cumulative impact was considered to occur if a project would increase the freeway v/c ratio on a facility already operating at LOS E or F by 0.01 or more.

- Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit;

- Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways;

- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;

- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) An example of a safety risk may be a lane or lanes queuing back from an intersection into the next controlled intersection or mainline freeway or freeway ramp facility or exceeding the available storage length of a left-turn pocket ;

- Result in inadequate emergency access; or

- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

Project Description

The proposed project would consist of a new 148,000 square foot Costco Wholesale warehouse with a tire center, a food court and a Costco fuel station that includes 16 fueling stations with the potential to

expand to 20 fueling stations. Per the project applicant's request, the trip generation evaluation is based on a 148,000 square foot warehouse and 20 fueling stations. The 15.33-acre project site is currently vacant and is located on the east side of Airport Park Boulevard between the existing Ken Fowler Auto Center and the Mendocino Brewing Company. As proposed, 643 parking stalls will be provided. The project site plan is shown in Figure 6.

Project Trip Generation

The estimate of new project generated vehicle trips was based on traffic surveys gathered at three Costco stores in similar market areas, all of which include Costco fueling stations. This information was provided by Kittleson & Associates and is included in Appendix D. The p.m. peak hour trip generation rate for the proposed Costco project was based on the average p.m. peak hour rate of the three representative Costco sites. Since the data for these representative sites did not include daily or a.m. peak hour trip generation information, rates for these periods were obtained using a ratio between this custom average rate and the average rates for Discount Club uses (Land Use Code 857) published by the Institute of Transportation Engineers (ITE) in *Trip Generation*, 8th Edition, 2008.

It should be noted that the surveyed trip generation rates include traffic associated with only a 12-position fueling station, while the project is proposing a potential for expanding to 20 fueling positions. Therefore, potential trips associated with the eight additional fueling stations were added to the overall trips by applying the average rate for Gas Stations (Land Use Code 944) published by the Institute of Transportation Engineers (ITE) in *Trip Generation*, 8th Edition, 2008.

A summary of the surveyed Costco sites as well as the p.m. peak hour trips and associated trip rates are shown in Table 10.

Table 10
Existing Costco Sizes and PM Peak Hour Trips/Rates

Costco Location	Total Store Size	PM Peak Hour Trips	PM Peak Hour Trip Rate (trips per 1,000 square feet)
Turlock, California	136,778	910	6.65
Eureka, California	121,202	877	7.24
Carson City, Nevada	148,663	948	6.38
Average	**135,548**	**912**	**6.76**

As shown in Table 11, the project's total trip generation is projected to be 11,204 new trips per weekday. Of these, 144 are expected during the a.m. peak hour, and 700 are expected during the p.m. peak hour.

Table 11
Proposed Costco Trip Generation Summary

Land Use	Size	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Costco w/ 12 vfp Gas Station	148 ksf	66.6	9,856	0.89	132	94	38	6.76	1,000	491	509
Additional Gas Positions	8 vfp	168.56	1,348	12.16	97	50	47	13.87	111	55	56
Sub-total			11,204		229	144	85		1,111	546	565
Pass-by Trips			*n/a*	*37%*	*-85*	*-53*	*-32*	*37%*	*-411*	*-202*	*-209*
Total Trips			**11,204**		**144**	**91**	**53**		**700**	**344**	**356**

Note: vfp = vehicle fueling positions; ksf = thousand square feet

North

Not to Scale

SOURCE: David Babcock & Associates, 2011; and ESA, 2011

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Costco DEIR Traffic & Circulation Report
City of Ukiah

Figure 6
Site Plan

Saturday Trips

The project is expected to generate 8,708 net new trips per weekend day, which is less than the 11,204 weekday trips. However, while the project would generate approximately 907 net new trips during the Saturday peak hour, which is more than the weekday peak hour trip generation of 700 trips, existing traffic volumes during the Saturday peak were approximately 31 percent lower than those during the weekday p.m. peak hour. In order to ensure that there were not unidentified impacts during the Saturday peak, these conditions were evaluated and these results are presented in another section.

Pass-by Trips

Some portion of traffic associated with commercial uses is typically drawn from existing traffic on nearby streets. These vehicle trips are not considered "new," but are instead comprised of drivers who are already driving on the adjacent street and choose to make an interim stop. These types of trips are referred to as "pass-by." Based on trip type data collected at Costco sites throughout the country that is included in Appendix D, an average pass-by trip percentage of 37 percent is experienced during both the a.m. and p.m. peak periods. These pass-by trips were assumed to be attracted from both Talmage Road as well as traffic on Airport Park Boulevard.

Project Trip Distribution

Based on the population densities for the market area provided from the market study completed for the Costco project, the distribution of project traffic was determined. The distribution assumptions shown in Table 12 were used to assign the project vehicle generated trips throughout the surrounding circulation system.

Table 12
Trip Distribution

Origin/Destination	Distribution Percentage
US 101 north of Talmage Rd	34
US 101 south of Talmage Rd	8
South State St north of Mill St	22
South State St south of Hastings Ave	5
Washington Ave west of South State St	2
Gobbi St west of South State St	7
Mill St west of South State St	7
Gobbi Street east of South State St	5
Babcock Ln north of Talmage Rd	1
Mill St east of South State St	1
Waugh Ln north of Talmage Rd	1
Talmage Rd east of Hastings Frontage Rd	7
TOTAL	**100**

Since through traffic is prohibited on the northbound approach at the intersection of Talmage Road/Airport Park Boulevard, trips exiting the project site destined for the residential neighborhoods north of Talmage Road were distributed to this area via Waugh Lane, South State Street and Gobbi Street. Although southbound through traffic is permitted at the intersection of Talmage Road/Airport

Park Boulevard, inbound project related trips from this residential neighborhood were distributed to the project site via alternative routes. If traffic volumes had been assigned via the southbound approach from the neighborhood, the resulting traffic volume increase on this approach would not have been significantly different.

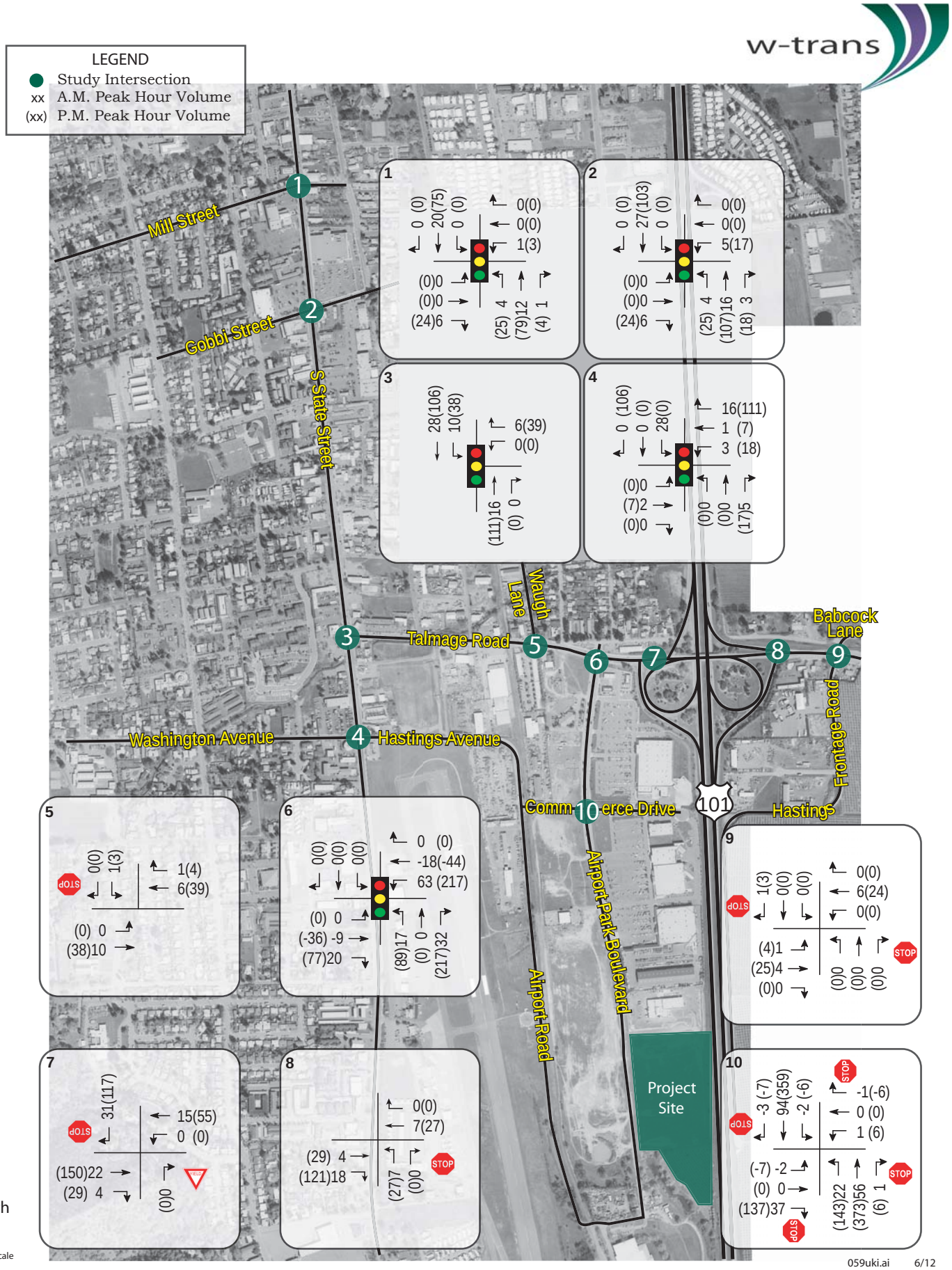
It is likely that some vehicle trips would be made between the proposed project and surrounding uses such as Walmart, Staples and FoodMaxx. Because quantifying the proportion of these types of linked trips would be difficult and subject to change over time, the traffic analysis is conservative in that it includes no deductions, so all trips were assumed to be arriving from and destined to areas beyond the immediate vicinity.

The Project-Only traffic volumes resulting from the applied trip generation and distribution estimates are presented in Figure 7. These traffic volumes present the potential increase in traffic that would be generated by the proposed project, including turning movements associated with pass-by trips coming from Talmage Road and Airport Park Boulevard. Potential traffic impacts associated with the proposed project were determined by adding these project-generated trips to the established existing, baseline and future traffic volumes described above, and the resulting changes considered in light of the applied significance criteria.

Existing plus Project Traffic Impacts

Intersection Conditions

With Existing plus Project traffic volumes, all of the study intersections are expected to continue operating at acceptable levels of service during both peak periods, except intersection #6, Talmage Road/Airport Park Boulevard, which is expected to operate at LOS E overall during the p.m. peak hour. Existing plus Project traffic operation at the study intersections is summarized in Table 13. These conditions do not include any of the planned improvements.



Costco DEIR Traffic & Circulation Report
City of Ukiah

Figure 7
Project Traffic Volumes

Table 13
Summary of Existing plus Project Level of Service Calculations

Intersection	AM Peak Hour		PM Peak Hour	
Minor Approach	Delay	LOS	Delay	LOS
1. South State St/Mill St	9.3	A	14.0	B
2. South State St/Gobbi St	25.2	C	43.0	D
3. South State St/Talmage Rd	23.7	C	39.1	D
4. South State St/Hastings Ave	41	D	54.1	D
5. Talmage Rd/Waugh Ln	1.3	A	2.8	A
Southbound Approach	*14.5*	*B*	*27.8*	*D*
6. Talmage Rd/Airport Park Blvd	*20.5*	*C*	***62.7***	***E***
Mitigation – Two WB Left-Turn Lanes	23.4	C	33.1	C
7. Talmage Rd/US 101 SB Off-Ramp	9.2	A	39.6	D
Southbound Right-Turn	*24.9*	*C*	*122.1*	*F*
Northbound Right-Turn	*12.9*	*B*	*57.8*	*F*
Mitigation Alternative – (Traffic Signal)	21.2	C	27.7	C
8. Talmage Rd/US 101 NB Off-Ramp	2.4	A	4.0	A
Northbound Approach	*13.7*	*B*	*20.6*	*C*
9. Talmage Rd/Hastings Frontage Rd	1.9	A	2.7	A
Northbound Approach	*16.5*	*C*	*27.5*	*D*
Southbound Approach	*15.2*	*C*	*22.3*	*C*
10. Airport Park Blvd/Commerce Dr	10.2	B	27.0	D
US 101 Freeway Segments	**Northbound**		**Southbound**	
PM Peak Hour	**Vp**	**LOS**	**Vp**	**LOS**
North of Talmage Rd-SR 222	767	B	758	B
South of Talmage Rd-SR 222	386	A	383	A

Notes: Delay is in average seconds per vehicle; LOS = Level of Service; **Bold** = Deficient level of service; Shaded Cells = Mitigation measures; Vp = Service flow rate, measured in passenger cars per hour per lane

Impact 1: Under Existing plus Project conditions, the intersection of Talmage Road/Airport Park Boulevard is expected to operate unacceptably at LOS E during the p.m. peak period. This is considered a *Significant Impact.*

Mitigation Measure 1: Two left-turn lanes on should be installed the westbound Talmage Road approach to Talmage Road/Airport Park Boulevard. In order to operate acceptably, these improvements need to be accompanied by the improvements involving the southbound off-ramp. Prior to issuance of building permits, the project applicant shall provide proportional-share payments to the City of Ukiah for planned and recommended improvements.

Significance after Mitigation: Implementation of the recommended improvements at Talmage Road/ Airport Park Boulevard would result in acceptable operating conditions during both the a.m. and p.m. peak hours.

Interchange Area Queuing

Under Existing plus Project p.m. peak hour conditions, the projected maximum queues between intersections and in turn pockets near the Talmage Road interchange can be accommodated within the

available storage except at two location. The westbound Talmage Road left-turn lanes at Airport Park Boulevard are both projected to have maximum queues that extend beyond the available storage. Also, the US 101 Southbound Off-Ramp at Talmage Road is anticipated to have maximum queues that extend beyond the available storage. The northbound right-turn queue on Airport Park Boulevard at Talmage Road was found to extend beyond the adjacent driveway, but since this is a not a signalized intersection, the impact is considered to less than significant. A summary of the Existing plus Project p.m. peak hour queues is presented in Table 14. Copies of the SIMTRAFFIC Queuing Projections are contained in Appendix A.

Table 14
PM Peak Hour Queues Near Talmage Road-SR 222 Interchange – Existing plus Project

Intersection	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
6. Talmage Rd/Airport Park Blvd												
Available Storage	250	-	250	50	-	165	50	400	400	175	500	500
Maximum Queue	137	-	**262***	36	-	80	23	255	235	**252**	185	77
Mitigation – Two WB Left-Turn Lanes												
Available Storage	250	-	250	50	-	165	50	400	400	285	285	285
Maximum Queue	119	-	261	21	-	72	27	165	192	187	146	114
7. Talmage Rd/US 101 SB Off-Ramp												
Available Storage	-	-	1840	-	-	600	-	-	270	50	-	-
Maximum Queue	-	-	163	-	-	**1037**	-	-	4	23	-	-
Mitigation Alternative – (Traffic Signal)												
Available Storage	900	-	900	-	-	-	-	285	285	260	940	-
Maximum Queue	441	-	94	-	-	-	-	227	253	42	150	-
8. Talmage Rd/US 101 NB Off-Ramp												
Available Storage	930	-	-	-	-	-	-	-	-	-	-	-
Maximum Queue	79	-	-	-	-	-	-	-	-	-	-	-

Notes: Maximum Queue represents the actual maximum queues that develop within SIMTRAFFIC (values represent the average of 6 SIMTRAFFIC runs); All distances are measured in feet; **Bold** = movements where queues exceed available storage; Shaded Cells = mitigation options
* Queue is not considered significant since it does not extend into a controlled intersection.

Impact 2: Under Existing plus Project conditions, unacceptable queuing is expected to occur in the westbound left-turn lane at Talmage Road/Airport Park Boulevard. This is considered a *Significant Impact.*

Mitigation Measure 2: See Mitigation Measure 1.

Significance after Mitigation: Implementation of the recommended improvements at Talmage Road/ Airport Park Boulevard would result in acceptable queuing conditions during both the a.m. and p.m. peak hours.

Impact 3: Under Existing plus Project conditions, traffic associated with the proposed project would contribute to inadequate queuing storage in the southbound approach of the freeway off-ramp at the

intersection of Talmage Road/US 101 Southbound Off-Ramp. The Peak Hour Volume traffic signal warrant would be met. This is considered a *Significant Impact.*

Mitigation Measure 3: Implementation of either interchange modification would result in acceptable queuing conditions at Talmage Road/US 101 Southbound Off-Ramp.

Significance after Mitigation: Interchange modifications would result in acceptable queuing conditions during both the a.m. and p.m. peak hours.

Freeway Conditions

The segments of US 101 both to the north and to the south of Talmage Road (SR 222) are expected to operate acceptably at LOS A or B under Existing plus Project Conditions. The LOS results are summarized in Table 13 and calculation sheets are provided in Appendix C.

Baseline plus Project Traffic Impacts

Intersection Conditions

With Baseline plus Project traffic volumes, all of the study intersections are expected to continue operating at acceptable levels of service during both peak periods, except intersection #6, Talmage Road/Airport Park Boulevard, which is expected to operate at LOS E overall, and #7, Talmage Road/US 101 Southbound Off-Ramp would operate at LOS F, both during the p.m. peak hour. Baseline plus Project traffic operation at the study intersections is summarized in Table 15. As shown in Table 15, conditions for intersection #4, South State Street/Hastings Avenue-Airport Road, and intersection #10, Airport Park Boulevard/Commerce Drive, include the City's planned improvements.

Table 15
Summary of Baseline plus Project Level of Service Calculations

Intersection	AM Peak Hour		PM Peak Hour	
Minor Approach	**Delay**	**LOS**	**Delay**	**LOS**
1. South State St/Mill St	9.3	A	14.8	B
2. South State St/Gobbi St	25.4	C	45.1	D
3. South State St/Talmage Rd	24.5	C	42.8	C
4. South State St/Hastings Ave*	41.8	D	35.9	D
5. Talmage Rd/Waugh Ln	1.3	A	2.8	A
Southbound Approach	*14.6*	*B*	*28.7*	*D*
6. Talmage Rd/Airport Park Blvd	*20.7*	*C*	***73.5***	***E***
Mitigation – Two WB Left-Turn Lanes	23.8	C	37.3	D
7. Talmage Rd/US 101 SB Off-Ramp	10.2	A	**52.9**	**F**
Southbound Right-Turn	*27.9*	*C*	*163.7*	*F*
Northbound Right-Turn	*13.2*	*B*	*75.3*	*F*
Mitigation Alternative – (Traffic Signal)	21.3	C	32.1	C
8. Talmage Rd/US 101 NB Off-Ramp	2.5	A	4.6	A
Northbound Approach	*14.0*	*B*	*23.2*	*C*
9. Talmage Rd/Hastings Frontage Rd	2.1	A	3.4	A
Northbound Approach	*17.0*	*C*	*30.2*	*D*
Southbound Approach	*15.6*	*C*	*24.7*	*C*
10. Airport Park Blvd/Commerce Dr*	5.8	A	11.6	B
US 101 Freeway Segments	**Northbound**		**Southbound**	
PM Peak Hour	**Vp**	**LOS**	**Vp**	**LOS**
North of Talmage Rd-SR 222	785	B	780	B
South of Talmage Rd-SR 222	396	A	391	A

Notes: Delay is in average seconds per vehicle; LOS = Level of Service; * = Includes planned improvements; **Bold** = Deficient level of service; Shaded Cells = Mitigation measures; Vp = Service flow rate, measured in passenger cars per hour per lane

Impact 4: Under Baseline plus Project conditions, the intersections of Talmage Road/Airport Park Boulevard and Talmage Road/US 101 Southbound Off-Ramp are expected to operate unacceptably at LOS E and LOS F, respectively, both during the p.m. peak period. This is considered a *Significant Impact.*

Mitigation Measure 4: See Mitigation Measure 1.

Significance after Mitigation: Implementation of the recommended improvements at Talmage Road/ Airport Park Boulevard and the Talmage Road/US 101 Southbound Off-Ramp would result in acceptable operating conditions during both the a.m. and p.m. peak hours.

Interchange Area Queuing

Under Baseline plus Project p.m. peak hour conditions, the projected maximum queues between intersections and in turn pockets near the Talmage Road interchange can be accommodated within the available storage except at three locations. The northbound Airport Park Boulevard right-turn lane as well as the westbound Talmage Road left-turn lanes at the intersection of Talmage Road/ Airport Park Boulevard are expected to have maximum queues that extend beyond the available storage. Also, the

US 101 Southbound Off-Ramp at Talmage Road is anticipated to have maximum queues that extend well beyond the available storage. A summary of the Baseline plus Project p.m. peak hour queues is presented in Table 16. Copies of the SIMTRAFFIC Queuing Projections are contained in Appendix A.

Table 16
PM Peak Hour Queues Near Talmage Road-SR 222 Interchange – Baseline plus Project

Intersection	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
6. Talmage Rd/Airport Park Blvd												
Available Storage	250	-	250	50	-	165	50	400	400	175	500	500
Maximum Queue	124	-	**271**	28	-	70	45	251	237	**259**	312	111
Mitigation – Two WB Left-Turn Lanes												
Available Storage	250	-	250	50	-	165	50	400	400	285	285	285
Maximum Queue	170	-	**271***	24	-	83	47	177	246	**254**	254	133
7. Talmage Rd/US 101 SB Off-Ramp												
Available Storage	-	-	1840	-	-	600	-	-	270	50	-	-
Maximum Queue	-	-	242	-	-	**1192**	-	-	4	26	-	-
Mitigation Alternative – (Traffic Signal)												
Available Storage	900	-	900	-	-	-	-	285	285	260	940	-
Maximum Queue	508	-	135	-	-	-	-	271	**282**	44	160	-
8. Talmage Rd/US 101 NB Off-Ramp												
Available Storage	930	-	-	-	-	-	-	-	-	-	-	-
Maximum Queue	67	-	-	-	-	-	-	-	-	-	-	-

Notes: Maximum Queue represents the actual maximum queues that develop within SIMTRAFFIC (values represent the average of 6 SIMTRAFFIC runs); All distances are measured in feet; **Bold** = movements where queues exceed available storage; Shaded Cells = mitigation options; * Queue is not considered significant since it does not extend into a controlled intersection.

Impacts and Mitigation

Impact 5: Under Baseline plus Project conditions unacceptable queuing is expected to occur in the northbound right-turn lane as well as the eastbound left-turn lanes at Talmage Road/Airport Park Boulevard. This is considered a *Significant Impact.*

Mitigation Measure 5: See Mitigation Measure 1.

Significance after Mitigation: Implementation of the recommended improvements at Talmage Road/ Airport Park Boulevard would result in acceptable queuing conditions during both the a.m. and p.m. peak hours, except in the northbound right-turn lane on Airport Park Boulevard at Talmage Road where the maximum queue is expected to extend past the available storage. However; the queues on the northbound approach would not be considered significant under the significance criteria applied because they do not extend into a controlled intersection.

Impact 6: Under Baseline plus Project conditions, traffic associated with the proposed project would contribute to inadequate queuing storage in the southbound approach at the intersection of Talmage

Road/US 101 Southbound Off-Ramp. The Peak Hour Volume traffic signal warrant would be met. This is considered a *Significant Impact.*

Mitigation Measure 6: The recommended intersection improvements would result in acceptable queuing conditions at Talmage Road/US 101 Southbound Off-Ramp.

Significance after Mitigation: The off-ramp realignment and signalization would result in acceptable queuing conditions during both the a.m. and p.m. peak hours.

Freeway Conditions

The segments of US 101 both to the north and to the south of Talmage Road (SR 222) are expected to operate acceptably at LOS A or B under Baseline plus Project Conditions. The LOS results are summarized in Table 15 and calculation sheets are provided in Appendix C.

Future plus Project Traffic Impacts

Intersection Conditions

With Future plus Project traffic volumes, all of the study intersections are anticipated to continue operating at acceptable levels of service during both peak periods evaluated, except for intersections #4, South State Street/Hastings Avenue-Airport Road, #6, Talmage Road/Airport Park Boulevard, and #7, Talmage Road/US 101 Southbound Off-Ramp, which are expected to operate at LOS E or worse overall during one or both peak periods evaluated. A summary of the Future plus Project traffic operation at the study intersections is provided in Table 17. As shown in Table 17, conditions for intersection #4, South State Street/Hastings Avenue-Airport Road, and intersection #10, Airport Park Boulevard/Commerce Drive, include the City's planned improvements.

Table 17
Summary of Future plus Project LOS Calculations

Intersection	AM Peak Hour		PM Peak Hour	
Minor Approach	Delay	LOS	Delay	LOS
1. South State St/Mill St	10.5	B	16.6	B
2. South State St/Gobbi St	26.7	C	50.7	D
3. South State St/Talmage Rd	28.6	C	45.9	D
4. South State St/Hastings Ave*	54.7	D	**68.8**	**E**
Mitigation – Eastbound Left-Turn Lane	29.2	C	31.7	C
5. Talmage Rd/Waugh Ln	1.3	A	3.3	A
Southbound Approach	*13.7*	*B*	*33.4*	*D*
6. Talmage Rd/Airport Park Blvd	22.5	C	**77.7**	**F**
Mitigation – Two WB Left-Turn Lanes	28.0	C	49.9	D
7. Talmage Rd/US 101 SB Off-Ramp	15.5	C	**45.6**	**D**
Southbound Right-Turn	*42.0*	*E*	*135.0*	*F*
Northbound Right-Turn	*12.9*	*B*	*85.5*	*F*
Mitigation Alternative – (Traffic Signal)	13.2	B	24.8	C
8. Talmage Rd/US 101 NB Off-Ramp	2.7	A	4.2	A
Northbound Approach	*14.0*	*B*	*22.1*	*C*
9. Talmage Rd/Hastings Frontage Rd	1.9	A	3.1	A
Northbound Approach	*18.0*	*C*	*31.9*	*D*
Southbound Approach	*16.3*	*C*	*25.7*	*D*
10. Airport Park Blvd/Commerce Dr*	6.6	A	9.3	B
US 101 Freeway Segments	**Northbound**		**Southbound**	
PM Peak Hour	**Vp**	**LOS**	**Vp**	**LOS**
North of Talmage Rd-SR 222	763	B	1014	B
South of Talmage Rd-SR 222	555	A	632	A

Notes: Delay is in average seconds per vehicle; LOS = Level of Service; * = Includes planned improvements; **Bold** = Deficient level of service; Shaded Cells = Mitigation measures; Vp = Service flow rate, measured in passenger cars per hour per lane

Impact 7: Under Future plus Project conditions, the intersection of South State Street/Hastings Avenue-Airport Road is expected to operate unacceptably at LOS E during the p.m. peak period. This is considered a *Significant Impact.*

Mitigation Measure 7: In addition to the planned left-turn lane on the westbound approach of Airport Road, a left-turn lane on the eastbound Hastings Avenue approach should be installed at South State Street/Hastings Avenue-Airport Road.

Significance after Mitigation: Implementation of the planned and recommended improvements at South State Street/Hastings Avenue-Airport Road would result in acceptable operating conditions during the and p.m. peak hour.

Impact 8: Under Future plus Project conditions, the intersection of Talmage Road/Airport Park Boulevard is expected to operate unacceptably at LOS F during the p.m. peak period. This is considered a *Significant Impact.*

Mitigation Measure 8: See Mitigation Measure 1.

Significance after Mitigation: Implementation of the recommended improvements at Talmage Road/ Airport Park Boulevard would result in acceptable operating conditions during both the a.m. and p.m. peak hours.

Impact 9: Under Future plus Project conditions, the intersection of Talmage Road/US 101 Southbound Off-Ramp is expected to operate unacceptably at LOS E during the p.m. peak hour. The Peak Hour Volume traffic signal warrant would be met. This is considered a *Significant Impact.*

Mitigation Measure 9: See Mitigation Measure 6.

Significance after Mitigation: The off-ramp realignment and signalization would result in acceptable operating conditions during both the a.m. and p.m. peak hours.

Interchange Area Queuing

Under Future plus Project p.m. peak hour conditions, the projected maximum queues between intersections and in turn pockets near the Talmage Road interchange can be accommodated within the available storage except at two locations. The the westbound Talmage Road left-turn lanes at the intersection of Talmage Road/Airport Park Boulevard is expected to have maximum queues that extend beyond the available storage. Also, the US 101 Southbound Off-Ramp at Talmage Road is anticipated to have maximum queues that extend well beyond the available storage. A summary of the Future plus Project p.m. peak hour queues is presented in Table 18. Copies of the SIMTRAFFIC Queuing Projections are contained in Appendix A.

Table 18
PM Peak Hour Queues Near Talmage Road-SR 222 Interchange – Future plus Project

Intersection	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
6. Talmage Rd/Airport Park Blvd												
Available Storage	250	-	250	50	-	165	50	400	400	175	500	500
Maximum Queue	183	-	242	38	-	90	27	281	288	**255**	281	288
Mitigation – Two WB Left-Turn Lanes												
Available Storage	250	-	250	50	-	165	50	400	400	285	285	285
Maximum Queue	**341***	-	**475***	32	-	83	51	241	354	244	279	147
7. Talmage Rd/US 101 SB Off-Ramp												
Available Storage	-	-	1840	-	-	600	-	-	270	50	-	-
Maximum Queue	-	-	203	-	-	**1180**	-	-	7	29	-	-
Mitigation Alternative – (Traffic Signal)												
Available Storage	900	-	900	-	-	-	-	285	285	260	940	-
Maximum Queue	445	-	144	-	-	-	-	**273**	**264**	58	120	-
8. Talmage Rd/US 101 NB Off-Ramp												
Available Storage	930	-	-	-	-	-	-	-	-	-	-	-
Maximum Queue	76	-	-	-	-	-	-	-	-	-	-	-

Notes: Maximum Queue represents the actual maximum queues that develop within SIMTRAFFIC (values represent the average of 6 SIMTRAFFIC runs); All distances are measured in feet; **Bold** = movements where queues exceed available storage; Shaded Cells = mitigated conditions
* Queue is not considered significant since it does not extend into a controlled intersection.

Impact 10: Under Future plus Project conditions unacceptable queuing is expected to occur in the northbound right-turn lane as well as both westbound left-turn lanes at Talmage Road/Airport Park Boulevard. This is considered a *Significant Impact.*

Mitigation Measure 10: See Mitigation Measure 1.

Significance after Mitigation: Implementation of the recommended improvements at Talmage Road/ Airport Park Boulevard would result in acceptable queuing conditions during, except in the northbound right-turn lane on Airport Park Boulevard at Talmage Road where the maximum queue is expected to extend past the available storage. However; the queues on the northbound approach would not be considered significant because they do not extend into a controlled intersection (per the significance criteria).

Impact 11: Under Future plus Project conditions, traffic associated with the proposed project would contribute to inadequate queuing storage in the southbound approach at the intersection of Talmage Road/US 101 Southbound Off-Ramp. The Peak Hour Volume traffic signal warrant would be met. This is considered a *Significant Impact.*

Mitigation Measure 11: See Mitigation Measure 6.

Significance after Mitigation: The recommended off-ramp realignment and signalization would result in acceptable queuing conditions during both the p.m. peak hour.

Freeway Conditions

The segments of US 101 both to the north and to the south of Talmage Road (SR 222) are anticipated to operate acceptably at LOS A or B under Future plus Project Conditions. The LOS results are summarized in Table 17 and calculation sheets are provided in Appendix C.

Saturday Peak Hour Conditions

Because the project has its highest single hourly trip generation on a Saturday, conditions during this weekend peak hour were evaluated for Future plus Project conditions. The impacts to the intersections of Talmage Road/Airport Park Boulevard and Talmage Road/US 101 Southbound Ramps were found to be similar to what would be experienced during the weekday p.m. peak hour. These conditions were then tested with recommended mitigation measures and it was determined that the impacts during the Saturday peak hour would be fully mitigated to levels of service that are higher than projected for the weekday p.m. peak hour.

Site Access and Internal Circulation

Primary access to the Costco project site would be via two new access points on Airport Park Boulevard, while secondary driveways are proposed on the existing roadway that provides access to Ken Fowler Auto Center. It is expected that the majority of inbound traffic movements will be made via an unsignalized driveway on Airport Park Boulevard near the middle of the project frontage where an 85-foot long southbound left-turn pocket currently exists.

Sight Distance

At unsignalized intersections, a substantially clear line of sight should be maintained between the driver of a vehicle waiting at the crossroad and the driver of an approaching vehicle. Adequate time must be provided for the waiting vehicle to either cross, turn left, or turn right, without requiring the through traffic to radically alter their speed. Sight distances along Airport Park Boulevard at the proposed project access driveway locations were evaluated based on sight distance criteria contained in the *Highway Design Manual*. The recommended sight distances for minor street approaches that are either a private road or a driveway are based on stopping sight distance, with the approach travel speeds as the basis for determining the recommended sight distance.

Sight distances at the proposed Airport Park Boulevard project access driveway locations were field measured. Although sight distance requirements are not technically applicable to driveways, the stopping sight distance criterion for private street intersections was applied for evaluation purposes. The speed limit along the segment of Airport Park Boulevard at the proposed project access driveways is posted at 30 mph. Based on a design speed of 30 mph, the minimum stopping sight distance needed is 200 feet.

The estimated sight distance from the proposed project access driveways is clear for approximately 325 feet in both directions, which exceeds the minimum sight distance recommended for speeds up to 40 mph. Therefore, it was determined that there is adequate sight distance in both directions from the proposed project access driveway locations.

Though sight distance requirements are met at the proposed project access driveway locations, it is possible that vegetation situated on either side of the driveway or along the project frontage could impede clear sight lines if not maintained.

Impact 12: Though sight distance requirements are met, vegetation could impede clear sight lines.

Mitigation Measure 12: Vegetation located on either side of the project access driveway and along the project frontage should be periodically trimmed to maintain clear sight lines.

Internal Circulation

On-site circulation was evaluated for adequate maneuverability, including room to turn around, for both passenger vehicles and larger vehicles like delivery, garbage and fire trucks. Through use of the AutoTurn software application it was determined that both typical passenger vehicles as well as larger trucks would be able to negotiate the entire site. The project access driveways have widths and curve radii adequate to allow passenger vehicles and larger trucks to access the project site.

Future Alternative Transportation Assessment

Pedestrian Circulation and Facilities

Impact 13: The Costco project may be expected to result in a minor increase in pedestrian activity along the pedestrian routes leading to the project site from the local transit stop and within the project parking areas. This is considered a *Significant Impact.*

Mitigation Measure 13a: Install sidewalks along the project frontage on Airport Park Boulevard as identified in the project site plan*Mitigation Measure 13b*: Install high visibility crosswalk markings across driveway entrances to the project to increase visibility of pedestrians.

Mitigation Measure 13c: Install ADA compliant curb ramps at driveway crossings and transition points along the project frontage.

Mitigation Measure 17d: Install crosswalks across all four legs of the intersection of Airport Park Boulevard/Commerce Drive.

Significance after Mitigation: Construction of the recommended improvements would reduce the impact to *less-than-significant.*

Bicycle Circulation and Facilities

Impact 14: The Costco project would be expected to increase bicycle activity along the roadways and routes leading to the project site as well as increase the demand for short- and long-term bicycle parking at the project site.

Mitigation Measure 14a: Install Class II bike lanes along the project on Airport Park Boulevard.

Mitigation Measure 14b: Install short-term bicycle parking for project patrons and employees at a convenient location adjacent to the store's primary entry points. Per Article 7, Section 9086 of the Ukiah City Zoning Code the number of bicycle parking spaces required shall be not less than ten percent (10%) of the number of required off-street automobile parking spaces. Racks should be an appropriate design and installed correctly to ensure proper function. Long-term parking for employees in the form of bicycle lockers or covered parking spaces to reduce exposure to the elements and vandalism should be installed as a portion of the overall parking requirement. Resource information on bicycle parking facilities and installation guidelines can be found at http://www.bicyclinginfo.org/engineering/parking.cfm

Mitigation Measure 14c: The provision of through bicycle access on northbound Airport Park Boulevard into the Lorraine Street neighborhood is recommended to improve connectivity for bicyclists. Currently northbound movements from Airport Park Boulevard at Talmage Road are limited to left and right turns only. Providing access for northbound bicyclists via a bike lane pocket will improve access for northbound bicyclists.

Mitigation Measure 14d: As a component of the redesign and construction of the Hastings Road/ South State Street intersection the westbound Class II bike lane should be extended to the intersection to ensure continuous bicycle access to adjacent commercial and residential destinations on South State Street and in Ukiah's western neighborhoods.

Significance after Mitigation: Completion of the recommended facilities would reduce the impact to *less-than-significant.*

Transit Circulation and Facilities

Impact 15: The Costco project would increase ridership on transit routes that provide service to the project site.

Mitigation Measure 15: The project applicant shall work with the Mendocino Transit Authority and the City of Ukiah to identify a suitable location to install a bus stop with shelter along the project frontage on Airport Park Boulevard.

Study Participants and References

Study Participants

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Appendix A

Intersection Level of Service and Queuing Calculations

Intersection
Level of Service Calculations

HCM Signalized Intersection Capacity Analysis
1: Mill Street & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	67	56	2	65	9	42	406	7	8	302	22
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.95			0.98			1.00			0.99	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		1616			1686			3237			3223	
Flt Permitted		0.92			0.99			0.90			0.94	
Satd. Flow (perm)		1513			1679			2923			3041	
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)	45	73	61	2	71	10	46	441	8	9	328	24
RTOR Reduction (vph)	0	37	0	0	6	0	0	3	0	0	13	0
Lane Group Flow (vph)	0	142	0	0	77	0	0	492	0	0	348	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		605			672			1169			1216	
v/s Ratio Prot												
v/s Ratio Perm		c0.09			0.05			c0.17			0.11	
v/c Ratio		0.24			0.11			0.42			0.29	
Uniform Delay, d1		7.9			7.5			8.7			8.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.9			0.3			1.1			0.6	
Delay (s)		8.9			7.9			9.8			8.7	
Level of Service		A			A			A			A	
Approach Delay (s)		8.9			7.9			9.8			8.7	
Approach LOS		A			A			A			A	

Intersection Summary				
HCM Average Control Delay	9.1	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.33			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	50.5%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
2: Gobbi Street & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	203	51	97	230	46	32	417	88	51	312	23
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.97		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)	1630	1664		1630	1673		1630	3174		1630	3226	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1664		1630	1673		1630	3174		1630	3226	
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	221	55	105	250	50	35	453	96	55	339	25
RTOR Reduction (vph)	0	8	0	0	6	0	0	21	0	0	6	0
Lane Group Flow (vph)	66	268	0	105	294	0	35	528	0	55	358	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	6.8	24.8		8.2	26.2		2.9	17.2		4.3	18.6	
Effective Green, g (s)	6.8	24.8		8.2	26.2		2.9	17.2		4.3	18.6	
Actuated g/C Ratio	0.10	0.35		0.12	0.37		0.04	0.24		0.06	0.26	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	157	585		190	622		67	774		99	851	
v/s Ratio Prot	0.04	0.16		c0.06	c0.18		0.02	c0.17		0.03	c0.11	
v/s Ratio Perm												
v/c Ratio	0.42	0.46		0.55	0.47		0.52	0.68		0.56	0.42	
Uniform Delay, d1	30.0	17.7		29.4	16.9		33.1	24.2		32.2	21.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	2.6		3.5	2.6		7.2	2.5		6.6	0.3	
Delay (s)	31.8	20.2		32.9	19.4		40.3	26.7		38.8	21.8	
Level of Service	C	C		C	B		D	C		D	C	
Approach Delay (s)		22.5			22.9			27.5			24.1	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM Average Control Delay	24.6	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	70.5	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	53.0%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
3: Talmage Road & State Street

1/16/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	305	235	296	179	212	253
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.94			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3075			3187
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3075			3187
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	332	255	322	195	230	275
RTOR Reduction (vph)	0	175	84	0	0	0
Lane Group Flow (vph)	332	80	433	0	0	505
Turn Type		Perm			Split	
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	20.8	20.8	15.1			16.4
Effective Green, g (s)	20.8	20.8	15.1			16.4
Actuated g/C Ratio	0.31	0.31	0.23			0.25
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	511	457	700			788
v/s Ratio Prot	c0.20		c0.14			c0.16
v/s Ratio Perm		0.05				
v/c Ratio	0.65	0.18	0.62			0.64
Uniform Delay, d1	19.6	16.5	23.0			22.3
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	2.8	0.2	1.2			1.3
Delay (s)	22.5	16.7	24.2			23.7
Level of Service	C	B	C			C
Approach Delay (s)	20.0		24.2			23.7
Approach LOS	B		C			C

Intersection Summary				
HCM Average Control Delay	22.5	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.64			
Actuated Cycle Length (s)	66.3	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	59.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Washington Avenue & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	181	115	50	42	48	54	34	496	46	42	481	158
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.98			0.95		1.00	0.99		1.00	0.96	
Flt Protected		0.97			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1639			1605		1630	1694		1630	3139	
Flt Permitted		0.73			0.84		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1221			1361		1630	1694		1630	3139	
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)	197	125	54	46	52	59	37	539	50	46	523	172
RTOR Reduction (vph)	0	6	0	0	24	0	0	4	0	0	34	0
Lane Group Flow (vph)	0	370	0	0	133	0	37	585	0	46	661	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		25.1			25.1		3.4	47.2		3.4	47.2	
Effective Green, g (s)		25.1			25.1		3.4	47.2		3.4	47.2	
Actuated g/C Ratio		0.29			0.29		0.04	0.54		0.04	0.54	
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)		349			390		63	912		63	1689	
v/s Ratio Prot							0.02	c0.35		c0.03	0.21	
v/s Ratio Perm		c0.30			0.10							
v/c Ratio		1.06			0.34		0.59	0.64		0.73	0.39	
Uniform Delay, d1		31.3			24.8		41.5	14.3		41.7	11.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		64.6			0.5		13.2	3.5		34.9	0.7	
Delay (s)		95.9			25.3		54.7	17.7		76.6	12.5	
Level of Service		F			C		D	B		E	B	
Approach Delay (s)		95.9			25.3			19.9			16.5	
Approach LOS		F			C			B			B	

Intersection Summary				
HCM Average Control Delay	34.1	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	87.7	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	72.0%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	41	345	0	0	538	38	0	0	0	26	0	45
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	45	375	0	0	585	41	0	0	0	28	0	49
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.90						0.90	0.90		0.90	0.90	0.90
vC, conflicting volume	626			375			1098	1090	188	861	1049	585
vC1, stage 1 conf vol							464	464		585	585	
vC2, stage 2 conf vol							634	626		277	464	
vCu, unblocked vol	526			375			1052	1043	188	789	997	480
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			100	100	100	94	100	90
cM capacity (veh/h)	943			1180			312	368	823	435	402	482

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	45	188	188	585	41	77
Volume Left	45	0	0	0	0	28
Volume Right	0	0	0	0	41	49
cSH	943	1700	1700	1700	1700	464
Volume to Capacity	0.05	0.11	0.11	0.34	0.02	0.17
Queue Length 95th (ft)	4	0	0	0	0	15
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	14.3
Lane LOS	A					B
Approach Delay (s)	1.0			0.0		14.3
Approach LOS						B

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	48.2%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Talmage Road & Airport Park Boulevard

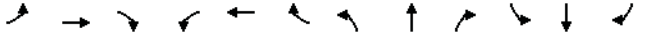
1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	245	100	243	472	15	115	0	199	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00		1.00		0.85	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)	1630	3118		1630	3245		3162		1458	1630	1625	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3118		1630	3245		3162		1458	1630	1625	
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)	9	266	109	264	513	16	125	0	216	10	33	18
RTOR Reduction (vph)	0	32	0	0	1	0	0	0	139	0	17	0
Lane Group Flow (vph)	9	343	0	264	528	0	125	0	77	10	34	0
Turn Type	Prot			Prot			custom		custom	Split		
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	0.7	33.8		16.0	49.1		7.4		27.4	4.0	4.0	
Effective Green, g (s)	0.7	33.8		16.0	49.1		7.4		27.4	4.0	4.0	
Actuated g/C Ratio	0.01	0.44		0.21	0.64		0.10		0.35	0.05	0.05	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	15	1365		338	2064		303		517	84	84	
v/s Ratio Prot	0.01	0.11		c0.16	c0.16		c0.04		0.05	0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.60	0.25		0.78	0.26		0.41		0.15	0.12	0.40	
Uniform Delay, d1	38.1	13.7		28.9	6.1		32.9		17.0	34.9	35.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	36.3	0.4		10.3	0.3		0.3		0.0	0.2	1.2	
Delay (s)	74.4	14.1		39.3	6.4		33.2		17.0	35.2	36.6	
Level of Service	E	B		D	A		C		B	D	D	
Approach Delay (s)		15.6			17.3			22.9			36.4	
Approach LOS		B			B			C			D	

Intersection Summary				
HCM Average Control Delay	18.9	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.41			
Actuated Cycle Length (s)	77.2	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	45.7%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
7: Talmage Road & U.S. 101 SB Ramps

1/16/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑				↱			↱
Volume (veh/h)	0	416	0	0	320	0	0	0	137	0	0	413
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
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)	0	452	0	0	348	0	0	0	149	0	0	449
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.94			0.94	0.94	0.94	0.94	0.94	
vC, conflicting volume	348			452			1249	800	452	949	800	348
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	348			386			1233	755	386	914	755	348
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	76	100	100	35
cM capacity (veh/h)	1211			1103			51	317	623	182	317	695

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	452	348	149	449
Volume Left	0	0	0	0
Volume Right	0	0	149	449
cSH	1700	1700	623	695
Volume to Capacity	0.27	0.20	0.24	0.65
Queue Length 95th (ft)	0	0	23	118
Control Delay (s)	0.0	0.0	12.6	19.1
Lane LOS			B	C
Approach Delay (s)	0.0	0.0	12.6	19.1
Approach LOS			B	C

Intersection Summary				
Average Delay	7.5			
Intersection Capacity Utilization	52.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: Talmage Road & U.S. 101 NB Ramps

1/16/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↰	↱
Volume (veh/h)	268	0	0	274	82	27
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	291	0	0	298	89	29
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			291		589	291
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			291		589	291
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		81	96
cM capacity (veh/h)			1270		471	748

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	291	298	118
Volume Left	0	0	89
Volume Right	0	0	29
cSH	1700	1700	626
Volume to Capacity	0.17	0.18	0.19
Queue Length 95th (ft)	0	0	17
Control Delay (s)	0.0	0.0	13.3
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.3
Approach LOS			B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Talmage Road & Hastings Frontage Road

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	22	284	6	2	348	20	16	2	6	25	3	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	24	309	7	2	378	22	17	2	7	27	3	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	400			315			782	764	312	761	757	389
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	400			315			782	764	312	761	757	389
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			94	99	99	91	99	96
cM capacity (veh/h)	1159			1245			292	326	728	312	330	659

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	339	402	26	58
Volume Left	24	2	17	27
Volume Right	7	22	7	27
cSH	1159	1245	347	417
Volume to Capacity	0.02	0.00	0.08	0.14
Queue Length 95th (ft)	2	0	6	12
Control Delay (s)	0.8	0.1	16.2	15.0
Lane LOS	A	A	C	C
Approach Delay (s)	0.8	0.1	16.2	15.0
Approach LOS			C	C

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		

AM Peak Hour - Existing Conditions
Costco Traffic & Circulation Report
City of Ukiah

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Base Volume Alternative)

Intersection #10 Airport Park Blvd/Hastings Ave-Commerce Dr

Cycle (sec): 100 Critical Vol./Cap.(X): 0.283
Loss Time (sec): 0 Average Delay (sec/veh): 9.2
Optimal Cycle: 0 Level Of Service: A

Street Name:	Airport Park Blvd						Hastings Ave-Commerce Dr					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0 1	1 0	1	0 1	1 0	0	0 1!	0 0	0	0 1!	0 0
Volume Module: >> Count Date: 10 Feb 2010 << 8:00 - 9:00 am												
Base Vol:	28	129	5	36	170	71	56	54	58	1	21	28
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	28	129	5	36	170	71	56	54	58	1	21	28
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
PHF Volume:	32	148	6	41	196	82	64	62	67	1	24	32
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	32	148	6	41	196	82	64	62	67	1	24	32
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	32	148	6	41	196	82	64	62	67	1	24	32
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.93	0.07	1.00	1.41	0.59	0.33	0.32	0.35	0.02	0.42	0.56
Final Sat.:	580	1222	48	599	944	416	227	219	236	13	278	371
Capacity Analysis Module:												
Vol/Sat:	0.06	0.12	0.12	0.07	0.21	0.20	0.28	0.28	0.28	0.09	0.09	0.09
Crit Moves:		****			****		****				****	
Delay/Veh:	9.0	8.9	8.8	9.0	9.2	8.8	9.8	9.8	9.8	8.4	8.4	8.4
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.0	8.9	8.8	9.0	9.2	8.8	9.8	9.8	9.8	8.4	8.4	8.4
LOS by Move:	A	A	A	A	A	A	A	A	A	A	A	A
ApproachDel:		8.9			9.1			9.8			8.4	
Delay Adj:		1.00			1.00			1.00			1.00	
ApprAdjDel:		8.9			9.1			9.8			8.4	
LOS by Appr:		A			A			A			A	
AllWayAvgQ:	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.1	0.1	0.1

Note: Queue reported is the number of cars per lane.

HCM Signalized Intersection Capacity Analysis
1: Mill Street & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	69	58	10	70	7	32	682	9	8	629	38
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.96			0.99			1.00			0.99	
Flt Protected		0.98			0.99			1.00			1.00	
Satd. Flow (prot)		1618			1686			3246			3231	
Flt Permitted		0.90			0.97			0.91			0.94	
Satd. Flow (perm)		1473			1638			2946			3054	
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)	62	75	63	11	76	8	35	741	10	9	684	41
RTOR Reduction (vph)	0	38	0	0	5	0	0	2	0	0	11	0
Lane Group Flow (vph)	0	162	0	0	90	0	0	784	0	0	723	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		589			655			1178			1222	
v/s Ratio Prot												
v/s Ratio Perm		c0.11			0.06			c0.27			0.24	
v/c Ratio		0.28			0.14			0.67			0.59	
Uniform Delay, d1		8.1			7.6			9.8			9.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			0.4			3.0			2.1	
Delay (s)		9.2			8.1			12.8			11.5	
Level of Service		A			A			B			B	
Approach Delay (s)		9.2			8.1			12.8			11.5	
Approach LOS		A			A			B			B	

Intersection Summary				
HCM Average Control Delay	11.6	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	70.1%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Gobbi Street & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	219	46	192	192	60	72	559	122	108	594	43
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.96		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)	1630	1671		1630	1655		1630	3172		1630	3227	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1671		1630	1655		1630	3172		1630	3227	
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	238	50	209	209	65	78	608	133	117	646	47
RTOR Reduction (vph)	0	8	0	0	10	0	0	21	0	0	6	0
Lane Group Flow (vph)	95	280	0	209	264	0	78	720	0	117	687	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	8.8	24.1		14.8	30.1		7.2	23.1		8.0	23.9	
Effective Green, g (s)	8.8	24.1		14.8	30.1		7.2	23.1		8.0	23.9	
Actuated g/C Ratio	0.10	0.28		0.17	0.35		0.08	0.27		0.09	0.28	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	167	468		281	579		136	852		152	897	
v/s Ratio Prot	0.06	c0.17		c0.13	0.16		0.05	c0.23		0.07	c0.21	
v/s Ratio Perm												
v/c Ratio	0.57	0.60		0.74	0.46		0.57	0.84		0.77	0.77	
Uniform Delay, d1	36.8	26.8		33.8	21.6		37.9	29.8		38.1	28.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.4	5.6		10.2	2.6		5.7	7.7		20.6	4.0	
Delay (s)	41.2	32.3		44.0	24.2		43.7	37.5		58.7	32.4	
Level of Service	D	C		D	C		D	D		E	C	
Approach Delay (s)		34.5			32.8			38.1			36.2	
Approach LOS		C			C			D			D	

Intersection Summary				
HCM Average Control Delay	35.9	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	86.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	67.9%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Talmage Road & State Street

1/16/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	308	252	363	251	288	380
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.94			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3060			3191
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3060			3191
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	335	274	395	273	313	413
RTOR Reduction (vph)	0	194	112	0	0	0
Lane Group Flow (vph)	335	80	556	0	0	726
Turn Type		Perm			Split	
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	24.1	24.1	20.3			24.1
Effective Green, g (s)	24.1	24.1	20.3			24.1
Actuated g/C Ratio	0.29	0.29	0.25			0.29
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	476	426	753			932
v/s Ratio Prot	c0.21		c0.18			c0.23
v/s Ratio Perm		0.05				
v/c Ratio	0.70	0.19	0.74			0.78
Uniform Delay, d1	26.0	21.9	28.7			26.8
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	4.7	0.2	3.3			3.8
Delay (s)	30.7	22.1	31.9			30.6
Level of Service	C	C	C			C
Approach Delay (s)	26.8		31.9			30.6
Approach LOS	C		C			C

Intersection Summary				
HCM Average Control Delay	29.9	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.74			
Actuated Cycle Length (s)	82.5	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	70.3%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Washington Avenue & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	56	26	80	44	26	33	492	75	48	535	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.99			0.98		1.00	0.98		1.00	0.97	
Flt Protected		0.97			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1637			1632		1630	1681		1630	3159	
Flt Permitted		0.70			0.76		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1187			1267		1630	1681		1630	3159	
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)	165	61	28	87	48	28	36	535	82	52	582	152
RTOR Reduction (vph)	0	5	0	0	8	0	0	6	0	0	23	0
Lane Group Flow (vph)	0	249	0	0	155	0	36	611	0	52	711	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		20.8			20.8		3.3	48.3		3.3	48.3	
Effective Green, g (s)		20.8			20.8		3.3	48.3		3.3	48.3	
Actuated g/C Ratio		0.25			0.25		0.04	0.57		0.04	0.57	
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)		293			312		64	962		64	1808	
v/s Ratio Prot							0.02	c0.36		c0.03	0.23	
v/s Ratio Perm		c0.21			0.12							
v/c Ratio		0.85			0.50		0.56	0.64		0.81	0.39	
Uniform Delay, d1		30.3			27.3		39.8	12.1		40.2	10.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		19.9			1.2		10.8	3.2		52.3	0.6	
Delay (s)		50.2			28.5		50.7	15.3		92.6	10.6	
Level of Service		D			C		D	B		F	B	
Approach Delay (s)		50.2			28.5			17.3			16.0	
Approach LOS		D			C			B			B	

Intersection Summary				
HCM Average Control Delay	22.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	84.4	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	65.2%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	88	683	0	0	692	85	0	0	0	57	0	82
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	96	742	0	0	752	92	0	0	0	62	0	89
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.89						0.89	0.89		0.89	0.89	0.89
vC, conflicting volume	845			742			1775	1778	371	1315	1686	752
vC1, stage 1 conf vol							934	934		752	752	
vC2, stage 2 conf vol							841	845		562	934	
vCu, unblocked vol	765			742			1808	1812	371	1292	1708	661
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			100	100	100	79	100	76
cM capacity (veh/h)	764			861			127	204	626	291	244	365

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	96	371	371	752	92	151
Volume Left	96	0	0	0	0	62
Volume Right	0	0	0	0	92	89
cSH	764	1700	1700	1700	1700	331
Volume to Capacity	0.13	0.22	0.22	0.44	0.05	0.46
Queue Length 95th (ft)	11	0	0	0	0	57
Control Delay (s)	10.4	0.0	0.0	0.0	0.0	24.7
Lane LOS	B					C
Approach Delay (s)	1.2			0.0		24.7
Approach LOS						C

Intersection Summary				
Average Delay	2.6			
Intersection Capacity Utilization	63.7%	ICU Level of Service		B
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Talmage Road & Airport Park Boulevard

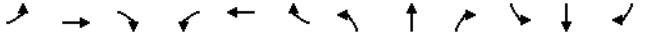
1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	402	252	357	478	14	223	0	464	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00		0.85	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)	1630	3071		1630	3246		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3071		1630	3246		3162		1458	1630	1629	
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)	15	437	274	388	520	15	242	0	504	14	51	26
RTOR Reduction (vph)	0	83	0	0	2	0	0	0	255	0	19	0
Lane Group Flow (vph)	15	628	0	388	533	0	242	0	249	14	58	0
Turn Type	Prot			Prot			custom		custom	Split		
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	0.7	30.0		24.5	53.8		11.6		40.1	6.4	6.4	
Effective Green, g (s)	0.7	30.0		24.5	53.8		11.6		40.1	6.4	6.4	
Actuated g/C Ratio	0.01	0.34		0.28	0.61		0.13		0.45	0.07	0.07	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	13	1041		451	1973		414		661	118	118	
v/s Ratio Prot	0.01	c0.20		c0.24	0.16		c0.08		0.17	0.01	c0.04	
v/s Ratio Perm												
v/c Ratio	1.15	0.60		0.86	0.27		0.58		0.38	0.12	0.49	
Uniform Delay, d1	43.9	24.3		30.4	8.1		36.2		16.0	38.4	39.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	305.0	2.6		14.9	0.3		1.4		0.1	0.2	1.2	
Delay (s)	348.9	26.9		45.2	8.5		37.5		16.1	38.6	40.6	
Level of Service	F	C		D	A		D		B	D	D	
Approach Delay (s)		33.5			23.9			23.0			40.3	
Approach LOS		C			C			C			D	

Intersection Summary				
HCM Average Control Delay	27.1	HCM Level of Service		C
HCM Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	88.5	Sum of lost time (s)		16.0
Intersection Capacity Utilization	65.9%	ICU Level of Service		C
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
7: Talmage Road & U.S. 101 SB Ramps

1/16/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	841	0	0	361	0	0	0	177	0	0	527
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
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)	0	914	0	0	392	0	0	0	192	0	0	573
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.81			0.81	0.81	0.81	0.81	0.81	
vC, conflicting volume	392			914			1879	1307	914	1499	1307	392
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	392			774			1970	1260	774	1499	1260	392
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	40	100	100	13
cM capacity (veh/h)	1166			679			5	137	322	33	137	656

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	914	392	192	573
Volume Left	0	0	0	0
Volume Right	0	0	192	573
cSH	1700	1700	322	656
Volume to Capacity	0.54	0.23	0.60	0.87
Queue Length 95th (ft)	0	0	91	258
Control Delay (s)	0.0	0.0	31.6	36.4
Lane LOS			D	E
Approach Delay (s)	0.0	0.0	31.6	36.4
Approach LOS			D	E

Intersection Summary				
Average Delay	13.0			
Intersection Capacity Utilization	66.6%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: Talmage Road & U.S. 101 NB Ramps

1/16/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	423	0	0	273	108	45
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	460	0	0	297	117	49
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			460		757	460
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			460		757	460
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		69	92
cM capacity (veh/h)			1101		376	601

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	460	297	166
Volume Left	0	0	117
Volume Right	0	0	49
cSH	1700	1700	477
Volume to Capacity	0.27	0.17	0.35
Queue Length 95th (ft)	0	0	39
Control Delay (s)	0.0	0.0	16.5
Lane LOS			C
Approach Delay (s)	0.0	0.0	16.5
Approach LOS			C

Intersection Summary				
Average Delay	3.0			
Intersection Capacity Utilization	67.1%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
9: Talmage Road & Hastings Frontage Road

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (veh/h)	47	419	18	2	392	18	19	3	2	31	2	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	51	455	20	2	426	20	21	3	2	34	2	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	446			475			1036	1017	465	1011	1017	436
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	446			475			1036	1017	465	1011	1017	436
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			89	99	100	84	99	96
cM capacity (veh/h)	1115			1087			192	226	597	207	226	620

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	526	448	26	63
Volume Left	51	2	21	34
Volume Right	20	20	2	27
cSH	1115	1087	208	292
Volume to Capacity	0.05	0.00	0.13	0.22
Queue Length 95th (ft)	4	0	11	20
Control Delay (s)	1.3	0.1	24.8	20.7
Lane LOS	A	A	C	C
Approach Delay (s)	1.3	0.1	24.8	20.7
Approach LOS			C	C

Intersection Summary					
Average Delay			2.5		
Intersection Capacity Utilization			65.3%	ICU Level of Service	C
Analysis Period (min)			15		

PM Peak Hour - Existing Conditions
Costco Traffic & Circulation Report
City of Ukiah

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Base Volume Alternative)

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********************************************************************************
Intersection #10 Airport Park Blvd/Hastings Ave-Commerce Dr
********************************************************************************
Cycle (sec):         100              Critical Vol./Cap.(X):          0.428
Loss Time (sec):       0              Average Delay (sec/veh):        11.0
Optimal Cycle:         0              Level Of Service:                  B
********************************************************************************
Street Name:        Airport Park Blvd            Hastings Ave-Commerce Dr
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign        Stop Sign        Stop Sign
Rights:           Include          Include          Include          Include
Min. Green:     0    0    0      0    0    0      0    0    0      0    0    0
Lanes:        1  0  1  1  0    1  0  1  1  0    0  0  1! 0  0    0  0  1! 0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 10 Feb 2010 << 4:15 - 5:15 pm
Base Vol:      79  268    8    66  188   79    79   79   79     4   50   73
Growth Adj:  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Initial Bse:   79  268    8    66  188   79    79   79   79     4   50   73
User Adj:    1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
PHF Adj:     0.93 0.93 0.93  0.93 0.93 0.93  0.93 0.93 0.93  0.93 0.93 0.93
PHF Volume:    85  287    9    71  202   85    85   85   85     4   54   78
Reduct Vol:     0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:   85  287    9    71  202   85    85   85   85     4   54   78
PCE Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
MLF Adj:     1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
FinalVolume:   85  287    9    71  202   85    85   85   85     4   54   78
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Adjustment:  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Lanes:       1.00 1.94 0.06  1.00 1.41 0.59  0.34 0.33 0.33  0.03 0.39 0.58
Final Sat.:   526 1105   33   521  807  355   198  198  198    18  225  328
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.16 0.26 0.26  0.14 0.25 0.24  0.43 0.43 0.43  0.24 0.24 0.24
Crit Moves:       ****            ****            ****            ****
Delay/Veh:   10.5 10.8 10.7  10.3 10.6 10.1  12.6 12.6 12.6  10.4 10.4 10.4
Delay Adj:   1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:  10.5 10.8 10.7  10.3 10.6 10.1  12.6 12.6 12.6  10.4 10.4 10.4
LOS by Move:    B    B    B     B    B    B     B    B    B     B    B    B
ApproachDel:      10.7            10.4            12.6            10.4
Delay Adj:        1.00            1.00            1.00            1.00
ApprAdjDel:       10.7            10.4            12.6            10.4
LOS by Appr:         B               B               B               B
AllWayAvgQ:   0.2  0.3   0.3   0.1  0.3   0.3   0.6  0.6   0.6   0.3  0.3   0.3
********************************************************************************
Note: Queue reported is the number of cars per lane.
********************************************************************************
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HCM Signalized Intersection Capacity Analysis
1: Mill Street & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	67	59	2	65	9	44	414	7	8	312	22
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.95			0.98			1.00			0.99	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		1614			1686			3237			3224	
Flt Permitted		0.93			0.99			0.90			0.94	
Satd. Flow (perm)		1512			1679			2913			3043	
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)	45	73	64	2	71	10	48	450	8	9	339	24
RTOR Reduction (vph)	0	38	0	0	6	0	0	3	0	0	13	0
Lane Group Flow (vph)	0	144	0	0	77	0	0	503	0	0	359	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		605			672			1165			1217	
v/s Ratio Prot												
v/s Ratio Perm		c0.09			0.05			c0.17			0.12	
v/c Ratio		0.24			0.11			0.43			0.30	
Uniform Delay, d1		8.0			7.5			8.7			8.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.9			0.3			1.2			0.6	
Delay (s)		8.9			7.9			9.9			8.8	
Level of Service		A			A			A			A	
Approach Delay (s)		8.9			7.9			9.9			8.8	
Approach LOS		A			A			A			A	

Intersection Summary				
HCM Average Control Delay	9.2	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.33			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	51.3%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Gobbi Street & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	203	54	99	230	46	34	427	89	51	325	23
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.97		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)	1630	1661		1630	1673		1630	3175		1630	3227	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1661		1630	1673		1630	3175		1630	3227	
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	221	59	108	250	50	37	464	97	55	353	25
RTOR Reduction (vph)	0	9	0	0	6	0	0	21	0	0	6	0
Lane Group Flow (vph)	66	271	0	108	294	0	37	540	0	55	372	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	6.8	24.8		8.3	26.3		4.3	17.5		3.6	16.8	
Effective Green, g (s)	6.8	24.8		8.3	26.3		4.3	17.5		3.6	16.8	
Actuated g/C Ratio	0.10	0.35		0.12	0.37		0.06	0.25		0.05	0.24	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	158	587		193	627		100	791		84	772	
v/s Ratio Prot	0.04	0.16		c0.07	c0.18		0.02	c0.17		0.03	c0.12	
v/s Ratio Perm												
v/c Ratio	0.42	0.46		0.56	0.47		0.37	0.68		0.65	0.48	
Uniform Delay, d1	29.8	17.5		29.2	16.6		31.6	23.8		32.7	23.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	2.6		3.5	2.5		2.3	2.4		16.9	0.5	
Delay (s)	31.6	20.1		32.7	19.2		34.0	26.3		49.6	23.4	
Level of Service	C	C		C	B		C	C		D	C	
Approach Delay (s)		22.3			22.7			26.8			26.8	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM Average Control Delay	25.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	70.2	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	53.7%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Talmage Road & State Street

1/16/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	306	237	307	180	215	268
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.94			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3079			3189
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3079			3189
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	333	258	334	196	234	291
RTOR Reduction (vph)	0	178	78	0	0	0
Lane Group Flow (vph)	333	80	452	0	0	525
Turn Type		Perm			Split	
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	21.2	21.2	15.8			17.2
Effective Green, g (s)	21.2	21.2	15.8			17.2
Actuated g/C Ratio	0.31	0.31	0.23			0.25
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	507	453	713			804
v/s Ratio Prot	c0.20		c0.15			c0.16
v/s Ratio Perm		0.05				
v/c Ratio	0.66	0.18	0.63			0.65
Uniform Delay, d1	20.3	17.1	23.6			22.8
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	3.1	0.2	1.4			1.5
Delay (s)	23.4	17.3	25.0			24.3
Level of Service	C	B	C			C
Approach Delay (s)	20.8		25.0			24.3
Approach LOS	C		C			C

Intersection Summary				
HCM Average Control Delay	23.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.65			
Actuated Cycle Length (s)	68.2	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	60.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Washington Avenue & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	181	116	50	43	49	65	34	497	48	57	482	158
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.98		1.00	0.91		1.00	0.99		1.00	0.96	
Flt Protected		0.97		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1640		1630	1568		1630	1693		1630	3139	
Flt Permitted		0.75		0.53	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1257		909	1568		1630	1693		1630	3139	
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)	197	126	54	47	53	71	37	540	52	62	524	172
RTOR Reduction (vph)	0	6	0	0	51	0	0	4	0	0	33	0
Lane Group Flow (vph)	0	371	0	47	73	0	37	588	0	62	663	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		25.1		25.1	25.1		3.5	47.9		4.7	49.1	
Effective Green, g (s)		25.1		25.1	25.1		3.5	47.9		4.7	49.1	
Actuated g/C Ratio		0.28		0.28	0.28		0.04	0.53		0.05	0.55	
Clearance Time (s)		4.0		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	3.0	
Lane Grp Cap (vph)		352		254	439		64	904		85	1718	
v/s Ratio Prot					0.05		0.02	c0.35		c0.04	0.21	
v/s Ratio Perm		c0.29		0.05								
v/c Ratio		1.05		0.19	0.17		0.58	0.65		0.73	0.39	
Uniform Delay, d1		32.3		24.5	24.4		42.4	14.9		41.9	11.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		62.5		0.4	0.2		12.0	3.6		26.6	0.7	
Delay (s)		94.8		24.9	24.6		54.4	18.6		68.5	12.3	
Level of Service		F		C	C		D	B		E	B	
Approach Delay (s)		94.8			24.7			20.7			16.9	
Approach LOS		F			C			C			B	

Intersection Summary				
HCM Average Control Delay	34.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.79			
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	72.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	41	349	0	0	541	38	0	0	0	26	0	45
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	45	379	0	0	588	41	0	0	0	28	0	49
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.90						0.90	0.90		0.90	0.90	0.90
vC, conflicting volume	629			379			1105	1098	190	867	1057	588
vC1, stage 1 conf vol							468	468		588	588	
vC2, stage 2 conf vol							637	629		279	468	
vCu, unblocked vol	529			379			1060	1052	190	794	1005	483
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			100	100	100	93	100	90
cM capacity (veh/h)	940			1176			310	366	820	433	400	480

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	45	190	190	588	41	77
Volume Left	45	0	0	0	0	28
Volume Right	0	0	0	0	41	49
cSH	940	1700	1700	1700	1700	462
Volume to Capacity	0.05	0.11	0.11	0.35	0.02	0.17
Queue Length 95th (ft)	4	0	0	0	0	15
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	14.4
Lane LOS	A					B
Approach Delay (s)	0.9			0.0		14.4
Approach LOS						B

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	48.2%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Talmage Road & Airport Park Boulevard

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	248	101	262	475	15	115	0	212	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00		1.00		0.85	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)	1630	3118		1630	3245		3162		1458	1630	1625	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3118		1630	3245		3162		1458	1630	1625	
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)	9	270	110	285	516	16	125	0	230	10	33	18
RTOR Reduction (vph)	0	32	0	0	1	0	0	0	145	0	17	0
Lane Group Flow (vph)	9	348	0	285	531	0	125	0	85	10	34	0
Turn Type	Prot			Prot			custom		custom	Split		
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	0.7	32.9		17.1	49.3		7.5		28.6	4.0	4.0	
Effective Green, g (s)	0.7	32.9		17.1	49.3		7.5		28.6	4.0	4.0	
Actuated g/C Ratio	0.01	0.42		0.22	0.64		0.10		0.37	0.05	0.05	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	15	1324		360	2064		306		538	84	84	
v/s Ratio Prot	0.01	0.11		c0.17	c0.16		c0.04		0.06	0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.60	0.26		0.79	0.26		0.41		0.16	0.12	0.40	
Uniform Delay, d1	38.3	14.4		28.5	6.1		32.9		16.4	35.1	35.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	36.3	0.5		10.6	0.3		0.3		0.1	0.2	1.2	
Delay (s)	74.5	14.9		39.1	6.4		33.2		16.4	35.3	36.8	
Level of Service	E	B		D	A		C		B	D	D	
Approach Delay (s)		16.3			17.8			22.3			36.5	
Approach LOS		B			B			C			D	

Intersection Summary				
HCM Average Control Delay	19.2	HCM Level of Service		B
HCM Volume to Capacity ratio	0.42			
Actuated Cycle Length (s)	77.5	Sum of lost time (s)		12.0
Intersection Capacity Utilization	46.9%	ICU Level of Service		A
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
7: Talmage Road & U.S. 101 SB Ramps

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	429	0	0	329	0	0	0	141	0	0	426
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
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)	0	466	0	0	358	0	0	0	153	0	0	463
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.94			0.94	0.94	0.94	0.94	0.94	
vC, conflicting volume	358			466			1287	824	466	977	824	358
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	358			395			1272	777	395	941	777	358
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	75	100	100	33
cM capacity (veh/h)	1201			1088			44	307	612	171	307	687

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	466	358	153	463
Volume Left	0	0	0	0
Volume Right	0	0	153	463
cSH	1700	1700	612	687
Volume to Capacity	0.27	0.21	0.25	0.67
Queue Length 95th (ft)	0	0	25	131
Control Delay (s)	0.0	0.0	12.8	20.4
Lane LOS			B	C
Approach Delay (s)	0.0	0.0	12.8	20.4
Approach LOS			B	C

Intersection Summary				
Average Delay	7.9			
Intersection Capacity Utilization	54.1%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: Talmage Road & U.S. 101 NB Ramps

1/16/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	277	0	0	285	85	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	301	0	0	310	92	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			301		611	301
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			301		611	301
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		80	96
cM capacity (veh/h)			1260		457	739

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	301	310	125
Volume Left	0	0	92
Volume Right	0	0	33
cSH	1700	1700	619
Volume to Capacity	0.18	0.18	0.20
Queue Length 95th (ft)	0	0	19
Control Delay (s)	0.0	0.0	13.6
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.6
Approach LOS			B

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	38.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
9: Talmage Road & Hastings Frontage Road

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	23	289	9	4	355	20	19	3	8	25	4	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	25	314	10	4	386	22	21	3	9	27	4	28
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	408			324			805	785	319	785	779	397
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	408			324			805	785	319	785	779	397
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			93	99	99	91	99	96
cM capacity (veh/h)	1151			1236			279	316	722	298	319	653

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	349	412	33	60
Volume Left	25	4	21	27
Volume Right	10	22	9	28
cSH	1151	1236	339	404
Volume to Capacity	0.02	0.00	0.10	0.15
Queue Length 95th (ft)	2	0	8	13
Control Delay (s)	0.8	0.1	16.8	15.5
Lane LOS	A	A	C	C
Approach Delay (s)	0.8	0.1	16.8	15.5
Approach LOS			C	C

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	43.5%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
10: Commerce Drive & Airport Park Boulevard

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	54	74	1	21	28	38	139	5	36	186	71
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.93		1.00	1.00		1.00	0.96	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1599			1586		1630	3244		1630	3125	
Flt Permitted		0.87			0.99		0.58	1.00		0.65	1.00	
Satd. Flow (perm)		1420			1574		996	3244		1121	3125	
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)	64	59	80	1	23	30	41	151	5	39	202	77
RTOR Reduction (vph)	0	60	0	0	22	0	0	3	0	0	43	0
Lane Group Flow (vph)	0	143	0	0	32	0	41	153	0	39	236	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		6.6			6.6		11.6	11.6		11.6	11.6	
Effective Green, g (s)		6.6			6.6		11.6	11.6		11.6	11.6	
Actuated g/C Ratio		0.25			0.25		0.44	0.44		0.44	0.44	
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)		358			397		441	1436		496	1384	
v/s Ratio Prot								0.05			c0.08	
v/s Ratio Perm		c0.10			0.02		0.04			0.03		
v/c Ratio		0.40			0.08		0.09	0.11		0.08	0.17	
Uniform Delay, d1		8.2			7.5		4.2	4.3		4.2	4.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			0.1		0.1	0.0		0.1	0.1	
Delay (s)		8.9			7.6		4.3	4.3		4.3	4.5	
Level of Service		A			A		A	A		A	A	
Approach Delay (s)		8.9			7.6			4.3			4.4	
Approach LOS		A			A			A			A	

Intersection Summary					
HCM Average Control Delay	5.8	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.25				
Actuated Cycle Length (s)	26.2	Sum of lost time (s)		8.0	
Intersection Capacity Utilization	39.6%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
1: Mill Street & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	69	64	11	70	7	36	700	10	8	653	38
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.95			0.99			1.00			0.99	
Flt Protected		0.99			0.99			1.00			1.00	
Satd. Flow (prot)		1613			1686			3245			3232	
Flt Permitted		0.90			0.96			0.90			0.94	
Satd. Flow (perm)		1472			1632			2921			3055	
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)	62	75	70	12	76	8	39	761	11	9	710	41
RTOR Reduction (vph)	0	42	0	0	5	0	0	2	0	0	10	0
Lane Group Flow (vph)	0	165	0	0	91	0	0	809	0	0	750	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		589			653			1168			1222	
v/s Ratio Prot												
v/s Ratio Perm		c0.11			0.06			c0.28			0.25	
v/c Ratio		0.28			0.14			0.69			0.61	
Uniform Delay, d1		8.1			7.6			10.0			9.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			0.4			3.4			2.3	
Delay (s)		9.3			8.1			13.3			11.9	
Level of Service		A			A			B			B	
Approach Delay (s)		9.3			8.1			13.3			11.9	
Approach LOS		A			A			B			B	

Intersection Summary				
HCM Average Control Delay	12.0	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.49			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	71.9%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Gobbi Street & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	219	52	196	192	60	76	581	125	108	624	43
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.96		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)	1630	1666		1630	1655		1630	3173		1630	3228	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1666		1630	1655		1630	3173		1630	3228	
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	238	57	213	209	65	83	632	136	117	678	47
RTOR Reduction (vph)	0	9	0	0	10	0	0	21	0	0	6	0
Lane Group Flow (vph)	95	286	0	213	264	0	83	747	0	117	719	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	8.9	24.0		15.1	30.2		7.3	23.6		8.1	24.4	
Effective Green, g (s)	8.9	24.0		15.1	30.2		7.3	23.6		8.1	24.4	
Actuated g/C Ratio	0.10	0.28		0.17	0.35		0.08	0.27		0.09	0.28	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	167	461		284	576		137	863		152	907	
v/s Ratio Prot	0.06	c0.17		c0.13	0.16		0.05	c0.24		0.07	c0.22	
v/s Ratio Perm												
v/c Ratio	0.57	0.62		0.75	0.46		0.61	0.87		0.77	0.79	
Uniform Delay, d1	37.1	27.4		34.1	21.9		38.4	30.1		38.4	28.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.4	6.1		10.6	2.6		7.4	9.1		20.6	4.8	
Delay (s)	41.5	33.6		44.7	24.6		45.7	39.1		59.0	33.7	
Level of Service	D	C		D	C		D	D		E	C	
Approach Delay (s)		35.5			33.3			39.8			37.2	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM Average Control Delay	37.1	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.74			
Actuated Cycle Length (s)	86.8	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	69.3%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Talmage Road & State Street

1/16/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	310	258	386	253	301	407
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.94			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3066			3192
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3066			3192
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	337	280	420	275	327	442
RTOR Reduction (vph)	0	200	97	0	0	0
Lane Group Flow (vph)	337	80	598	0	0	769
Turn Type		Perm			Split	
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	24.7	24.7	21.6			26.0
Effective Green, g (s)	24.7	24.7	21.6			26.0
Actuated g/C Ratio	0.29	0.29	0.25			0.30
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	467	417	767			962
v/s Ratio Prot	c0.21		c0.19			c0.24
v/s Ratio Perm		0.05				
v/c Ratio	0.72	0.19	0.78			0.80
Uniform Delay, d1	27.7	23.3	30.1			27.7
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	5.4	0.2	4.6			4.4
Delay (s)	33.1	23.5	34.7			32.2
Level of Service	C	C	C			C
Approach Delay (s)	28.8		34.7			32.2
Approach LOS	C		C			C

Intersection Summary				
HCM Average Control Delay	32.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.77			
Actuated Cycle Length (s)	86.3	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	72.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Washington Avenue & State Street

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	58	26	83	45	49	33	494	79	76	537	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.99		1.00	0.92		1.00	0.98		1.00	0.97	
Flt Protected		0.97		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1638		1630	1582		1630	1680		1630	3159	
Flt Permitted		0.74		0.62	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1258		1072	1582		1630	1680		1630	3159	
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)	165	63	28	90	49	53	36	537	86	83	584	152
RTOR Reduction (vph)	0	5	0	0	40	0	0	6	0	0	22	0
Lane Group Flow (vph)	0	251	0	90	62	0	36	617	0	83	714	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		20.6		20.6	20.6		3.4	49.3		4.6	50.5	
Effective Green, g (s)		20.6		20.6	20.6		3.4	49.3		4.6	50.5	
Actuated g/C Ratio		0.24		0.24	0.24		0.04	0.57		0.05	0.58	
Clearance Time (s)		4.0		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	3.0	
Lane Grp Cap (vph)		300		255	377		64	958		87	1844	
v/s Ratio Prot					0.04		0.02	c0.37		c0.05	0.23	
v/s Ratio Perm		c0.20		0.08								
v/c Ratio		0.84		0.35	0.16		0.56	0.64		0.95	0.39	
Uniform Delay, d1		31.3		27.4	26.1		40.8	12.6		40.8	9.7	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		17.9		0.8	0.2		10.8	3.3		80.6	0.6	
Delay (s)		49.2		28.3	26.3		51.7	16.0		121.5	10.3	
Level of Service		D		C	C		D	B		F	B	
Approach Delay (s)		49.2			27.2			17.9			21.6	
Approach LOS		D			C			B			C	

Intersection Summary				
HCM Average Control Delay	24.6	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	86.5	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	68.8%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	88	698	0	0	700	85	0	0	0	58	0	82
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	96	759	0	0	761	92	0	0	0	63	0	89
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.89						0.89	0.89		0.89	0.89	0.89
vC, conflicting volume	853			759			1800	1803	379	1332	1711	761
vC1, stage 1 conf vol							950	950		761	761	
vC2, stage 2 conf vol							850	853		571	950	
vCu, unblocked vol	774			759			1837	1840	379	1311	1737	671
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			100	100	100	78	100	75
cM capacity (veh/h)	758			849			123	201	618	286	240	360

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	96	379	379	761	92	152
Volume Left	96	0	0	0	0	63
Volume Right	0	0	0	0	92	89
cSH	758	1700	1700	1700	1700	325
Volume to Capacity	0.13	0.22	0.22	0.45	0.05	0.47
Queue Length 95th (ft)	11	0	0	0	0	59
Control Delay (s)	10.4	0.0	0.0	0.0	0.0	25.4
Lane LOS	B					D
Approach Delay (s)	1.2			0.0		25.4
Approach LOS						D

Intersection Summary				
Average Delay	2.6			
Intersection Capacity Utilization	64.2%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Talmage Road & Airport Park Boulevard

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	410	259	398	486	14	223	0	491	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00		0.85	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)	1630	3070		1630	3246		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3070		1630	3246		3162		1458	1630	1629	
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)	15	446	282	433	528	15	242	0	534	14	51	26
RTOR Reduction (vph)	0	87	0	0	2	0	0	0	247	0	19	0
Lane Group Flow (vph)	15	641	0	433	541	0	242	0	287	14	58	0
Turn Type	Prot			Prot			custom		custom	Split		
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	0.7	29.6		26.3	55.2		11.6		41.9	6.5	6.5	
Effective Green, g (s)	0.7	29.6		26.3	55.2		11.6		41.9	6.5	6.5	
Actuated g/C Ratio	0.01	0.33		0.29	0.61		0.13		0.47	0.07	0.07	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	13	1010		476	1991		408		679	118	118	
v/s Ratio Prot	0.01	c0.21		c0.27	0.17		c0.08		0.20	0.01	c0.04	
v/s Ratio Perm												
v/c Ratio	1.15	0.64		0.91	0.27		0.59		0.42	0.12	0.49	
Uniform Delay, d1	44.6	25.6		30.7	8.1		37.0		16.0	39.1	40.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	305.0	3.0		20.7	0.3		1.5		0.2	0.2	1.2	
Delay (s)	349.6	28.7		51.4	8.4		38.5		16.2	39.2	41.3	
Level of Service	F	C		D	A		D		B	D	D	
Approach Delay (s)		35.1			27.5			23.1			41.0	
Approach LOS		D			C			C			D	

Intersection Summary					
HCM Average Control Delay	28.9	HCM Level of Service		C	
HCM Volume to Capacity ratio	0.71				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	68.8%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Unsignalized Intersection Capacity Analysis
7: Talmage Road & U.S. 101 SB Ramps

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑				↱			↱
Volume (veh/h)	0	872	0	0	382	0	0	0	186	0	0	555
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
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)	0	948	0	0	415	0	0	0	202	0	0	603
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.80			0.80	0.80	0.80	0.80	0.80	
vC, conflicting volume	415			948			1966	1363	948	1565	1363	415
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	415			808			2084	1328	808	1582	1328	415
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	33	100	100	5
cM capacity (veh/h)	1144			652			2	124	304	24	124	637

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	948	415	202	603
Volume Left	0	0	0	0
Volume Right	0	0	202	603
cSH	1700	1700	304	637
Volume to Capacity	0.56	0.24	0.67	0.95
Queue Length 95th (ft)	0	0	111	327
Control Delay (s)	0.0	0.0	37.5	49.1
Lane LOS			E	E
Approach Delay (s)	0.0	0.0	37.5	49.1
Approach LOS			E	E

Intersection Summary				
Average Delay			17.2	
Intersection Capacity Utilization			69.0%	ICU Level of Service
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
8: Talmage Road & U.S. 101 NB Ramps

1/16/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↰	↱
Volume (veh/h)	444	0	0	297	114	54
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	483	0	0	323	124	59
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			483		805	483
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			483		805	483
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		65	90
cM capacity (veh/h)			1080		352	584

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	483	323	183
Volume Left	0	0	124
Volume Right	0	0	59
cSH	1700	1700	461
Volume to Capacity	0.28	0.19	0.40
Queue Length 95th (ft)	0	0	47
Control Delay (s)	0.0	0.0	17.9
Lane LOS			C
Approach Delay (s)	0.0	0.0	17.9
Approach LOS			C

Intersection Summary				
Average Delay			3.3	
Intersection Capacity Utilization			69.5%	ICU Level of Service
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
9: Talmage Road & Hastings Frontage Road

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	49	431	26	8	404	18	27	5	8	31	4	27
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	53	468	28	9	439	20	29	5	9	34	4	29
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	459			497			1087	1065	483	1067	1070	449
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	459			497			1087	1065	483	1067	1070	449
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			99			83	97	99	82	98	95
cM capacity (veh/h)	1102			1067			174	210	584	185	209	610

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	550	467	43	67
Volume Left	53	9	29	34
Volume Right	28	20	9	29
cSH	1102	1067	207	268
Volume to Capacity	0.05	0.01	0.21	0.25
Queue Length 95th (ft)	4	1	19	24
Control Delay (s)	1.3	0.2	26.9	22.9
Lane LOS	A	A	D	C
Approach Delay (s)	1.3	0.2	26.9	22.9
Approach LOS			D	C

Intersection Summary				
Average Delay			3.2	
Intersection Capacity Utilization			66.8%	ICU Level of Service
Analysis Period (min)			15	

HCM Signalized Intersection Capacity Analysis
10: Commerce Drive & Airport Park Boulevard

1/16/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	94	79	88	4	50	73	91	280	8	66	198	79
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.92		1.00	1.00		1.00	0.96	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1609			1580		1630	3246		1630	3120	
Flt Permitted		0.83			0.99		0.57	1.00		0.56	1.00	
Satd. Flow (perm)		1351			1560		975	3246		964	3120	
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)	102	86	96	4	54	79	99	304	9	72	215	86
RTOR Reduction (vph)	0	54	0	0	56	0	0	5	0	0	50	0
Lane Group Flow (vph)	0	230	0	0	81	0	99	308	0	72	251	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.3			8.3		12.0	12.0		12.0	12.0	
Effective Green, g (s)		8.3			8.3		12.0	12.0		12.0	12.0	
Actuated g/C Ratio		0.29			0.29		0.42	0.42		0.42	0.42	
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)		396			458		413	1376		409	1323	
v/s Ratio Prot								0.09			0.08	
v/s Ratio Perm		c0.17			0.05		c0.10			0.07		
v/c Ratio		0.58			0.18		0.24	0.22		0.18	0.19	
Uniform Delay, d1		8.5			7.5		5.2	5.2		5.1	5.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.1			0.2		0.3	0.1		0.2	0.1	
Delay (s)		10.6			7.6		5.5	5.3		5.3	5.2	
Level of Service		B			A		A	A		A	A	
Approach Delay (s)		10.6			7.6			5.3			5.2	
Approach LOS		B			A			A			A	

Intersection Summary				
HCM Average Control Delay		6.8	HCM Level of Service	A
HCM Volume to Capacity ratio		0.38		
Actuated Cycle Length (s)		28.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization		51.4%	ICU Level of Service	A
Analysis Period (min)		15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Mill Street & State Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	67	48	0	65	9	36	551	6	8	430	23
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.96			0.98			1.00			0.99	
Flt Protected		0.98			1.00			1.00			1.00	
Satd. Flow (prot)		1624			1689			3245			3233	
Flt Permitted		0.90			1.00			0.91			0.95	
Satd. Flow (perm)		1485			1689			2958			3062	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	55	71	51	0	68	9	38	580	6	8	453	24
RTOR Reduction (vph)	0	24	0	0	6	0	0	1	0	0	6	0
Lane Group Flow (vph)	0	153	0	0	71	0	0	623	0	0	479	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		21.0			21.0			31.0			31.0	
Effective Green, g (s)		21.0			21.0			31.0			31.0	
Actuated g/C Ratio		0.35			0.35			0.52			0.52	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		520			591			1528			1582	
v/s Ratio Prot					0.04							
v/s Ratio Perm		c0.10						c0.21			0.16	
v/c Ratio		0.29			0.12			0.41			0.30	
Uniform Delay, d1		14.1			13.2			8.9			8.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.4			0.4			0.8			0.5	
Delay (s)		15.6			13.6			9.7			8.8	
Level of Service		B			B			A			A	
Approach Delay (s)		15.6			13.6			9.7			8.8	
Approach LOS		B			B			A			A	

Intersection Summary				
HCM Average Control Delay	10.4	HCM Level of Service		B
HCM Volume to Capacity ratio	0.36			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		8.0
Intersection Capacity Utilization	58.6%	ICU Level of Service		B
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Gobbi Street & State Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	115	211	91	92	231	46	34	493	83	51	424	32
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.98		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)	1630	1638		1630	1673		1630	3190		1630	3225	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1638		1630	1673		1630	3190		1630	3225	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	121	222	96	97	243	48	36	519	87	54	446	34
RTOR Reduction (vph)	0	25	0	0	11	0	0	23	0	0	9	0
Lane Group Flow (vph)	121	293	0	97	280	0	36	583	0	54	471	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	5.2	18.8		4.5	18.1		1.4	13.8		2.8	15.2	
Effective Green, g (s)	5.2	18.8		4.5	18.1		1.4	13.8		2.8	15.2	
Actuated g/C Ratio	0.09	0.34		0.08	0.32		0.03	0.25		0.05	0.27	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	152	551		131	542		41	788		82	877	
v/s Ratio Prot	c0.07	c0.18		0.06	0.17		0.02	c0.18		0.03	c0.15	
v/s Ratio Perm												
v/c Ratio	0.80	0.53		0.74	0.52		0.88	0.74		0.66	0.54	
Uniform Delay, d1	24.8	15.0		25.1	15.3		27.2	19.4		26.1	17.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.3	3.7		20.0	3.5		92.9	3.7		17.5	0.6	
Delay (s)	49.2	18.7		45.1	18.8		120.1	23.1		43.6	18.0	
Level of Service	D	B		D	B		F	C		D	B	
Approach Delay (s)		27.1			25.4			28.5			20.6	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM Average Control Delay	25.5	HCM Level of Service		C
HCM Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	55.9	Sum of lost time (s)		8.0
Intersection Capacity Utilization	57.9%	ICU Level of Service		B
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Talmage Road & State Street

6/21/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	310	211	388	215	225	361
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.95			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3086			3198
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3086			3198
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	326	222	408	226	237	380
RTOR Reduction (vph)	0	162	139	0	0	0
Lane Group Flow (vph)	326	60	495	0	0	617
Turn Type		Perm			Split	
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	14.1	14.1	12.6			11.2
Effective Green, g (s)	14.1	14.1	12.6			11.2
Actuated g/C Ratio	0.27	0.27	0.24			0.22
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	443	396	749			690
v/s Ratio Prot	c0.20		c0.16			c0.19
v/s Ratio Perm		0.04				
v/c Ratio	0.74	0.15	0.66			0.89
Uniform Delay, d1	17.2	14.4	17.7			19.8
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	6.3	0.2	1.7			13.7
Delay (s)	23.5	14.5	19.4			33.5
Level of Service	C	B	B			C
Approach Delay (s)	19.8		19.4			33.5
Approach LOS	B		B			C

Intersection Summary				
HCM Average Control Delay	24.4	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	51.9	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	67.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Washington Avenue & State Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	181	205	50	47	53	66	34	615	126	103	532	160
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.98		1.00	0.92		1.00	0.97		1.00	0.97	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1655		1630	1574		1630	1672		1630	3147	
Flt Permitted		0.79		0.45	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1338		778	1574		1630	1672		1630	3147	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	191	216	53	49	56	69	36	647	133	108	560	168
RTOR Reduction (vph)	0	5	0	0	46	0	0	8	0	0	29	0
Lane Group Flow (vph)	0	455	0	49	79	0	36	772	0	108	699	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		30.0		30.0	30.0		3.6	42.6		7.0	46.0	
Effective Green, g (s)		30.0		30.0	30.0		3.6	42.6		7.0	46.0	
Actuated g/C Ratio		0.33		0.33	0.33		0.04	0.47		0.08	0.50	
Clearance Time (s)		4.0		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	3.0	
Lane Grp Cap (vph)		438		255	516		64	778		125	1580	
v/s Ratio Prot					0.05		0.02	c0.46		c0.07	c0.22	
v/s Ratio Perm		c0.34		0.06								
v/c Ratio		1.04		0.19	0.15		0.56	0.99		0.86	0.44	
Uniform Delay, d1		30.8		22.1	21.8		43.2	24.3		41.8	14.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		53.2		0.4	0.1		10.8	30.4		42.1	0.9	
Delay (s)		84.0		22.5	21.9		54.1	54.8		83.9	15.5	
Level of Service		F		C	C		D	D		F	B	
Approach Delay (s)		84.0			22.1			54.8			24.3	
Approach LOS		F			C			D			C	

Intersection Summary				
HCM Average Control Delay	47.0	HCM Level of Service	D	
HCM Volume to Capacity ratio	1.03			
Actuated Cycle Length (s)	91.6	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	92.2%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	46	385	0	0	513	53	0	0	0	24	0	45
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	48	405	0	0	540	56	0	0	0	25	0	47
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.90						0.90	0.90		0.90	0.90	0.90
vC, conflicting volume	596			405			1089	1098	203	839	1042	540
vC1, stage 1 conf vol							502	502		540	540	
vC2, stage 2 conf vol							587	596		299	502	
vCu, unblocked vol	499			405			1045	1055	203	769	993	437
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			100	100	100	94	100	91
cM capacity (veh/h)	971			1150			325	369	804	453	405	517

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	48	203	203	540	56	73
Volume Left	48	0	0	0	0	25
Volume Right	0	0	0	0	56	47
cSH	971	1700	1700	1700	1700	493
Volume to Capacity	0.05	0.12	0.12	0.32	0.03	0.15
Queue Length 95th (ft)	4	0	0	0	0	13
Control Delay (s)	8.9	0.0	0.0	0.0	0.0	13.6
Lane LOS	A					B
Approach Delay (s)	0.9			0.0		13.6
Approach LOS						B

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	47.1%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Talmage Road & Airport Park Boulevard

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	259	112	355	494	15	106	0	206	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00		1.00		0.85	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)	1630	3112		1630	3245		3162		1458	1630	1623	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3112		1630	3245		3162		1458	1630	1623	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	273	118	374	520	16	112	0	217	9	32	18
RTOR Reduction (vph)	0	41	0	0	1	0	0	0	123	0	17	0
Lane Group Flow (vph)	8	350	0	374	535	0	112	0	94	9	33	0
Turn Type	Prot			Prot			custom		custom	Split		
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	0.7	27.8		22.1	49.2		7.1		33.2	4.0	4.0	
Effective Green, g (s)	0.7	27.8		22.1	49.2		7.1		33.2	4.0	4.0	
Actuated g/C Ratio	0.01	0.36		0.29	0.64		0.09		0.43	0.05	0.05	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	15	1124		468	2073		292		629	85	84	
v/s Ratio Prot	0.00	c0.11		c0.23	0.16		c0.04		0.06	0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.53	0.31		0.80	0.26		0.38		0.15	0.11	0.39	
Uniform Delay, d1	38.0	17.7		25.4	6.0		32.9		13.3	34.8	35.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	17.0	0.7		8.7	0.3		0.3		0.0	0.2	1.1	
Delay (s)	55.0	18.4		34.1	6.3		33.2		13.4	35.0	36.4	
Level of Service	D	B		C	A		C		B	C	D	
Approach Delay (s)		19.2			17.7			20.1			36.2	
Approach LOS		B			B			C			D	

Intersection Summary					
HCM Average Control Delay	19.2	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.50				
Actuated Cycle Length (s)	77.0	Sum of lost time (s)		16.0	
Intersection Capacity Utilization	53.0%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Unsignalized Intersection Capacity Analysis
7: Talmage Road & U.S. 101 SB Ramps

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	436	0	0	404	0	0	0	137	0	0	496
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	459	0	0	425	0	0	0	144	0	0	522
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.93			0.93	0.93	0.93	0.93	0.93	
vC, conflicting volume	425			459			1406	884	459	1028	884	425
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	425			381			1399	838	381	993	838	425
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	77	100	100	17
cM capacity (veh/h)	1134			1095			19	281	620	160	281	629

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	459	425	144	522
Volume Left	0	0	0	0
Volume Right	0	0	144	522
cSH	1700	1700	620	629
Volume to Capacity	0.27	0.25	0.23	0.83
Queue Length 95th (ft)	0	0	22	221
Control Delay (s)	0.0	0.0	12.6	32.5
Lane LOS			B	D
Approach Delay (s)	0.0	0.0	12.6	32.5
Approach LOS			B	D

Intersection Summary				
Average Delay	12.1			
Intersection Capacity Utilization	63.1%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: Talmage Road & U.S. 101 NB Ramps

6/21/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	264	0	0	304	97	35
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	278	0	0	320	102	37
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			278		598	278
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			278		598	278
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		78	95
cM capacity (veh/h)			1285		465	761

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	278	320	139
Volume Left	0	0	102
Volume Right	0	0	37
cSH	1700	1700	633
Volume to Capacity	0.16	0.19	0.22
Queue Length 95th (ft)	0	0	21
Control Delay (s)	0.0	0.0	13.6
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.6
Approach LOS			B

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	35.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Talmage Road & Hastings Frontage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	21	285	9	2	430	20	19	2	6	25	3	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	22	300	9	2	453	21	20	2	6	26	3	26
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	474			309			844	827	305	824	821	463
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	474			309			844	827	305	824	821	463
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			92	99	99	91	99	96
cM capacity (veh/h)	1088			1251			264	300	735	283	303	599

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	332	476	28	56
Volume Left	22	2	20	26
Volume Right	9	21	6	26
cSH	1088	1251	311	379
Volume to Capacity	0.02	0.00	0.09	0.15
Queue Length 95th (ft)	2	0	7	13
Control Delay (s)	0.8	0.1	17.7	16.1
Lane LOS	A	A	C	C
Approach Delay (s)	0.8	0.1	17.7	16.1
Approach LOS			C	C

Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	43.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
10: Commerce Drive & Airport Park Boulevard

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	54	109	1	21	28	37	123	5	36	265	117
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.94			0.92		1.00	0.99		1.00	0.95	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1584			1585		1630	3242		1630	3110	
Flt Permitted		0.89			0.99		0.52	1.00		0.67	1.00	
Satd. Flow (perm)		1427			1575		884	3242		1144	3110	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	76	57	115	1	22	29	39	129	5	38	279	123
RTOR Reduction (vph)	0	67	0	0	20	0	0	3	0	0	73	0
Lane Group Flow (vph)	0	181	0	0	32	0	39	131	0	38	329	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.6			8.6		11.2	11.2		11.2	11.2	
Effective Green, g (s)		8.6			8.6		11.2	11.2		11.2	11.2	
Actuated g/C Ratio		0.31			0.31		0.40	0.40		0.40	0.40	
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)		441			487		356	1306		461	1253	
v/s Ratio Prot								0.04			c0.11	
v/s Ratio Perm		c0.13			0.02		0.04			0.03		
v/c Ratio		0.41			0.07		0.11	0.10		0.08	0.26	
Uniform Delay, d1		7.6			6.8		5.2	5.2		5.1	5.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			0.1		0.1	0.0		0.1	0.1	
Delay (s)		8.2			6.8		5.3	5.2		5.2	5.7	
Level of Service		A			A		A	A		A	A	
Approach Delay (s)		8.2			6.8			5.2			5.6	
Approach LOS		A			A			A			A	

Intersection Summary					
HCM Average Control Delay	6.3	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.33				
Actuated Cycle Length (s)	27.8	Sum of lost time (s)		8.0	
Intersection Capacity Utilization	46.7%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
1: State Street & Mill Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	69	42	8	70	7	20	832	7	8	734	47
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.97			0.99			1.00			0.99	
Flt Protected		0.98			1.00			1.00			1.00	
Satd. Flow (prot)		1630			1690			3252			3229	
Flt Permitted		0.89			0.98			0.93			0.95	
Satd. Flow (perm)		1475			1657			3024			3055	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	61	73	44	8	74	7	21	876	7	8	773	49
RTOR Reduction (vph)	0	26	0	0	4	0	0	1	0	0	11	0
Lane Group Flow (vph)	0	152	0	0	85	0	0	903	0	0	819	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		590			663			1210			1222	
v/s Ratio Prot												
v/s Ratio Perm		c0.10			0.05			c0.30			0.27	
v/c Ratio		0.26			0.13			0.75			0.67	
Uniform Delay, d1		8.0			7.6			10.3			9.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.1			0.4			4.2			2.9	
Delay (s)		9.1			8.0			14.5			12.8	
Level of Service		A			A			B			B	
Approach Delay (s)		9.1			8.0			14.5			12.8	
Approach LOS		A			A			B			B	

Intersection Summary				
HCM Average Control Delay	13.0	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	64.3%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: State Street & Gobbi Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	112	232	68	185	214	60	136	674	121	108	671	60
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.97		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)	1630	1657		1630	1659		1630	3186		1630	3220	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1657		1630	1659		1630	3186		1630	3220	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	118	244	72	195	225	63	143	709	127	114	706	63
RTOR Reduction (vph)	0	9	0	0	9	0	0	14	0	0	6	0
Lane Group Flow (vph)	118	307	0	195	279	0	143	822	0	114	763	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.3	29.2		15.8	32.7		12.5	30.8		10.0	28.3	
Effective Green, g (s)	12.3	29.2		15.8	32.7		12.5	30.8		10.0	28.3	
Actuated g/C Ratio	0.12	0.29		0.16	0.32		0.12	0.30		0.10	0.28	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	197	475		253	533		200	964		160	895	
v/s Ratio Prot	0.07	c0.19		c0.12	c0.17		0.09	c0.26		0.07	c0.24	
v/s Ratio Perm												
v/c Ratio	0.60	0.65		0.77	0.52		0.71	0.85		0.71	0.85	
Uniform Delay, d1	42.4	31.8		41.3	28.2		42.9	33.4		44.5	34.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	6.6		13.5	3.7		11.5	7.4		13.9	7.9	
Delay (s)	47.3	38.4		54.8	31.8		54.4	40.8		58.4	42.6	
Level of Service	D	D		D	C		D	D		E	D	
Approach Delay (s)		40.8			41.1			42.8			44.7	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM Average Control Delay	42.8	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	101.8	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	73.1%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: State Street & Talmage Road

6/21/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	319	309	452	266	321	410
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.94			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3079			3190
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3079			3190
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	336	325	476	280	338	432
RTOR Reduction (vph)	0	244	127	0	0	0
Lane Group Flow (vph)	336	81	629	0	0	770
Turn Type	NA	Perm	NA		Split	NA
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	16.1	16.1	16.4			17.9
Effective Green, g (s)	16.1	16.1	16.4			17.9
Actuated g/C Ratio	0.25	0.25	0.25			0.28
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	408	365	784			887
v/s Ratio Prot	c0.21		c0.20			c0.24
v/s Ratio Perm		0.06				
v/c Ratio	0.82	0.22	0.80			0.87
Uniform Delay, d1	22.8	19.2	22.5			22.1
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	12.6	0.3	5.6			8.7
Delay (s)	35.5	19.5	28.1			30.8
Level of Service	D	B	C			C
Approach Delay (s)	27.6		28.1			30.8
Approach LOS	C		C			C

Intersection Summary				
HCM Average Control Delay	28.9	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.83			
Actuated Cycle Length (s)	64.4	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	76.1%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: State Street & Washington Avenue/Hastings Avenue

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	159	79	31	130	58	14	37	612	123	43	589	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.98		1.00	0.97		1.00	0.97		1.00	0.97	
Flt Protected		0.97		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1640		1630	1665		1630	1673		1630	3166	
Flt Permitted		0.78		0.59	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1309		1011	1665		1630	1673		1630	3166	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	167	83	33	137	61	15	39	644	129	45	620	147
RTOR Reduction (vph)	0	5	0	0	9	0	0	7	0	0	19	0
Lane Group Flow (vph)	0	278	0	137	67	0	39	766	0	45	748	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		24.2		24.2	24.2		4.0	57.4		3.9	57.3	
Effective Green, g (s)		24.2		24.2	24.2		4.0	57.4		3.9	57.3	
Actuated g/C Ratio		0.25		0.25	0.25		0.04	0.59		0.04	0.59	
Clearance Time (s)		4.0		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	3.0	
Lane Grp Cap (vph)		325		251	413		67	985		65	1861	
v/s Ratio Prot					0.04		0.02	c0.46		c0.03	0.24	
v/s Ratio Perm		c0.21		0.14								
v/c Ratio		0.85		0.55	0.16		0.58	0.78		0.69	0.40	
Uniform Delay, d1		35.0		31.9	28.7		45.9	15.2		46.2	10.9	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		19.1		2.4	0.2		12.2	6.0		27.3	0.6	
Delay (s)		54.1		34.3	28.9		58.2	21.3		73.5	11.5	
Level of Service		D		C	C		E	C		E	B	
Approach Delay (s)		54.1			32.4			23.0			14.9	
Approach LOS		D			C			C			B	

Intersection Summary				
HCM Average Control Delay	25.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	97.5	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	72.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	88	732	0	0	752	84	0	0	0	74	0	82
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	93	771	0	0	792	88	0	0	0	78	0	86
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.89						0.89	0.89		0.89	0.89	0.89
vC, conflicting volume	880			771			1834	1836	385	1362	1747	792
vC1, stage 1 conf vol							956	956		792	792	
vC2, stage 2 conf vol							878	880		571	956	
vCu, unblocked vol	801			771			1876	1879	385	1344	1779	701
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			100	100	100	72	100	75
cM capacity (veh/h)	737			840			117	196	613	278	235	342

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	93	385	385	792	88	164
Volume Left	93	0	0	0	0	78
Volume Right	0	0	0	0	88	86
cSH	737	1700	1700	1700	1700	308
Volume to Capacity	0.13	0.23	0.23	0.47	0.05	0.53
Queue Length 95th (ft)	11	0	0	0	0	74
Control Delay (s)	10.6	0.0	0.0	0.0	0.0	29.2
Lane LOS	B					D
Approach Delay (s)	1.1			0.0		29.2
Approach LOS						D

Intersection Summary				
Average Delay	3.0			
Intersection Capacity Utilization	68.2%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road

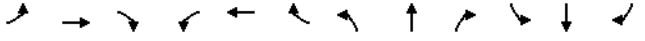
6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	417	309	397	491	14	283	0	597	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00		0.85	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)	1630	3052		1630	3246		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3052		1630	3246		3162		1458	1630	1629	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	439	325	418	517	15	298	0	628	14	49	25
RTOR Reduction (vph)	0	121	0	0	2	0	0	0	251	0	20	0
Lane Group Flow (vph)	15	643	0	418	530	0	298	0	377	14	54	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	0.7	27.6		24.3	51.2		13.2		41.5	6.2	6.2	
Effective Green, g (s)	0.7	27.6		24.3	51.2		13.2		41.5	6.2	6.2	
Actuated g/C Ratio	0.01	0.32		0.28	0.59		0.15		0.48	0.07	0.07	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	13	965		454	1904		478		693	116	116	
v/s Ratio Prot	0.01	c0.21		c0.26	0.16		c0.09		c0.26	0.01	c0.03	
v/s Ratio Perm												
v/c Ratio	1.15	0.67		0.92	0.28		0.62		0.54	0.12	0.46	
Uniform Delay, d1	43.3	25.9		30.6	8.9		34.7		16.2	38.0	38.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	305.0	3.6		23.7	0.4		1.8		0.5	0.2	1.1	
Delay (s)	348.3	29.5		54.3	9.3		36.5		16.7	38.2	40.0	
Level of Service	F	C		D	A		D		B	D	D	
Approach Delay (s)		35.6			29.1			23.1			39.7	
Approach LOS		D			C			C			D	

Intersection Summary				
HCM Average Control Delay	29.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	87.3	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	76.7%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
7: U.S. 101 SB Ramps & Talmage Road

6/21/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	921	0	0	391	0	0	0	196	0	0	569
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	969	0	0	412	0	0	0	206	0	0	599
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.80			0.80	0.80	0.80	0.80	0.80	
vC, conflicting volume	412			969			1980	1381	969	1587	1381	412
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	412			839			2098	1352	839	1609	1352	412
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	30	100	100	6
cM capacity (veh/h)	1147			639			2	120	293	20	120	640

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	969	412	206	599
Volume Left	0	0	0	0
Volume Right	0	0	206	599
cSH	1700	1700	293	640
Volume to Capacity	0.57	0.24	0.70	0.94
Queue Length 95th (ft)	0	0	122	316
Control Delay (s)	0.0	0.0	41.8	46.9
Lane LOS			E	E
Approach Delay (s)	0.0	0.0	41.8	46.9
Approach LOS			E	E

Intersection Summary				
Average Delay	16.8			
Intersection Capacity Utilization	72.5%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: U.S. 101 NB Ramps & Talmage Road

6/21/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	471	0	0	273	116	45
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	496	0	0	287	122	47
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			496		783	496
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			496		783	496
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		66	92
cM capacity (veh/h)			1068		362	574

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	496	287	169
Volume Left	0	0	122
Volume Right	0	0	47
cSH	1700	1700	453
Volume to Capacity	0.29	0.17	0.37
Queue Length 95th (ft)	0	0	43
Control Delay (s)	0.0	0.0	17.6
Lane LOS			C
Approach Delay (s)	0.0	0.0	17.6
Approach LOS			C

Intersection Summary				
Average Delay	3.1			
Intersection Capacity Utilization	74.6%	ICU Level of Service	D	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
9: Hastings Frontage Road & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	47	463	21	2	440	18	24	3	2	38	2	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	49	487	22	2	463	19	25	3	2	40	2	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	482			509			1107	1084	498	1078	1085	473
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	482			509			1107	1084	498	1078	1085	473
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			85	98	100	79	99	95
cM capacity (veh/h)	1081			1056			170	207	572	186	206	591

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	559	484	31	74
Volume Left	49	2	25	40
Volume Right	22	19	2	32
cSH	1081	1056	182	265
Volume to Capacity	0.05	0.00	0.17	0.28
Queue Length 95th (ft)	4	0	15	28
Control Delay (s)	1.3	0.1	28.7	23.8
Lane LOS	A	A	D	C
Approach Delay (s)	1.3	0.1	28.7	23.8
Approach LOS			D	C

Intersection Summary				
Average Delay			2.9	
Intersection Capacity Utilization			71.4%	ICU Level of Service
Analysis Period (min)			15	
				C

HCM Signalized Intersection Capacity Analysis
10: Airport Park Boulevard & Commerce Drive

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	79	47	4	50	75	36	416	8	66	283	79
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.92		1.00	1.00		1.00	0.97	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1632			1579		1630	3251		1630	3153	
Flt Permitted		0.81			0.99		0.53	1.00		0.49	1.00	
Satd. Flow (perm)		1341			1561		902	3251		847	3153	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	92	83	49	4	53	79	38	438	8	69	298	83
RTOR Reduction (vph)	0	23	0	0	57	0	0	2	0	0	39	0
Lane Group Flow (vph)	0	201	0	0	79	0	38	444	0	69	342	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.0			8.0		12.6	12.6		12.6	12.6	
Effective Green, g (s)		8.0			8.0		12.6	12.6		12.6	12.6	
Actuated g/C Ratio		0.28			0.28		0.44	0.44		0.44	0.44	
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)		375			437		397	1432		373	1389	
v/s Ratio Prot								c0.14			0.11	
v/s Ratio Perm		c0.15			0.05		0.04			0.08		
v/c Ratio		0.54			0.18		0.10	0.31		0.18	0.25	
Uniform Delay, d1		8.7			7.8		4.7	5.2		4.9	5.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.5			0.2		0.1	0.1		0.2	0.1	
Delay (s)		10.2			8.0		4.8	5.3		5.1	5.1	
Level of Service		B			A		A	A		A	A	
Approach Delay (s)		10.2			8.0			5.3			5.1	
Approach LOS		B			A			A			A	

Intersection Summary				
HCM Average Control Delay		6.4	HCM Level of Service	A
HCM Volume to Capacity ratio		0.40		
Actuated Cycle Length (s)		28.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization		51.0%	ICU Level of Service	A
Analysis Period (min)		15		
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: State Street & Mill Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	67	62	3	65	9	46	418	8	8	322	22
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.95			0.98			1.00			0.99	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		1612			1685			3235			3225	
Flt Permitted		0.93			0.99			0.89			0.94	
Satd. Flow (perm)		1511			1674			2900			3044	
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)	45	73	67	3	71	10	50	454	9	9	350	24
RTOR Reduction (vph)	0	40	0	0	6	0	0	3	0	0	12	0
Lane Group Flow (vph)	0	145	0	0	78	0	0	510	0	0	371	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		604			670			1160			1218	
v/s Ratio Prot												
v/s Ratio Perm		c0.10			0.05			c0.18			0.12	
v/c Ratio		0.24			0.12			0.44			0.30	
Uniform Delay, d1		8.0			7.6			8.7			8.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.9			0.4			1.2			0.6	
Delay (s)		8.9			7.9			9.9			8.8	
Level of Service		A			A			A			A	
Approach Delay (s)		8.9			7.9			9.9			8.8	
Approach LOS		A			A			A			A	

Intersection Summary				
HCM Average Control Delay	9.3	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.34			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	52.0%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: State Street & Gobbi Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	203	57	102	230	46	36	433	91	51	339	23
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.97		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)	1630	1659		1630	1673		1630	3175		1630	3229	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1659		1630	1673		1630	3175		1630	3229	
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	221	62	111	250	50	39	471	99	55	368	25
RTOR Reduction (vph)	0	10	0	0	6	0	0	21	0	0	5	0
Lane Group Flow (vph)	66	273	0	111	294	0	39	549	0	55	388	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	6.8	24.8		8.5	26.5		4.3	17.8		3.6	17.1	
Effective Green, g (s)	6.8	24.8		8.5	26.5		4.3	17.8		3.6	17.1	
Actuated g/C Ratio	0.10	0.35		0.12	0.37		0.06	0.25		0.05	0.24	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	157	582		196	627		99	799		83	781	
v/s Ratio Prot	0.04	0.16		c0.07	c0.18		0.02	c0.17		0.03	c0.12	
v/s Ratio Perm												
v/c Ratio	0.42	0.47		0.57	0.47		0.39	0.69		0.66	0.50	
Uniform Delay, d1	30.1	17.8		29.4	16.8		31.9	23.9		33.0	23.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	2.7		3.7	2.5		2.6	2.5		18.1	0.5	
Delay (s)	31.9	20.5		33.1	19.3		34.5	26.4		51.1	23.6	
Level of Service	C	C		C	B		C	C		D	C	
Approach Delay (s)		22.7			23.0			26.9			27.0	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM Average Control Delay	25.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	70.7	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	54.3%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: State Street & Talmage Road

6/21/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	305	241	312	179	222	281
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.95			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3081			3189
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3081			3189
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	332	262	339	195	241	305
RTOR Reduction (vph)	0	181	74	0	0	0
Lane Group Flow (vph)	332	81	460	0	0	546
Turn Type	NA	Perm	NA		Split	NA
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	21.5	21.5	16.2			17.8
Effective Green, g (s)	21.5	21.5	16.2			17.8
Actuated g/C Ratio	0.31	0.31	0.23			0.26
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	504	451	718			817
v/s Ratio Prot	c0.20		c0.15			c0.17
v/s Ratio Perm		0.06				
v/c Ratio	0.66	0.18	0.64			0.67
Uniform Delay, d1	20.8	17.6	24.0			23.2
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	3.1	0.2	1.5			1.6
Delay (s)	23.9	17.7	25.5			24.8
Level of Service	C	B	C			C
Approach Delay (s)	21.2		25.5			24.8
Approach LOS	C		C			C

Intersection Summary				
HCM Average Control Delay	23.7	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.66			
Actuated Cycle Length (s)	69.5	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	61.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: State Street & Washington Avenue/Hastings Avenue

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	181	117	50	45	49	70	34	496	51	70	481	158
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.98			0.94		1.00	0.99		1.00	0.96	
Flt Protected		0.97			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1640			1595		1630	1692		1630	3139	
Flt Permitted		0.70			0.84		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1174			1355		1630	1692		1630	3139	
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)	197	127	54	49	53	76	37	539	55	76	523	172
RTOR Reduction (vph)	0	6	0	0	30	0	0	4	0	0	33	0
Lane Group Flow (vph)	0	372	0	0	148	0	37	590	0	76	662	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		25.1			25.1		3.5	47.9		4.7	49.1	
Effective Green, g (s)		25.1			25.1		3.5	47.9		4.7	49.1	
Actuated g/C Ratio		0.28			0.28		0.04	0.53		0.05	0.55	
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)		329			379		64	904		85	1718	
v/s Ratio Prot							0.02	c0.35		c0.05	0.21	
v/s Ratio Perm		c0.32			0.11							
v/c Ratio		1.13			0.39		0.58	0.65		0.89	0.39	
Uniform Delay, d1		32.3			26.1		42.4	14.9		42.3	11.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		89.3			0.7		12.0	3.7		63.3	0.7	
Delay (s)		121.6			26.8		54.4	18.6		105.5	12.3	
Level of Service		F			C		D	B		F	B	
Approach Delay (s)		121.6			26.8			20.7			21.5	
Approach LOS		F			C			C			C	

Intersection Summary				
HCM Average Control Delay	41.0	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.82			
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	73.4%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	41	355	0	0	544	39	0	0	0	27	0	45
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	45	386	0	0	591	42	0	0	0	29	0	49
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.90						0.90	0.90		0.90	0.90	0.90
vC, conflicting volume	634			386			1115	1109	193	873	1066	591
vC1, stage 1 conf vol							475	475		591	591	
vC2, stage 2 conf vol							640	634		282	475	
vCu, unblocked vol	540			386			1074	1066	193	806	1019	493
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			100	100	100	93	100	90
cM capacity (veh/h)	937			1169			307	364	816	430	397	476

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	45	193	193	591	42	78
Volume Left	45	0	0	0	0	29
Volume Right	0	0	0	0	42	49
cSH	937	1700	1700	1700	1700	457
Volume to Capacity	0.05	0.11	0.11	0.35	0.02	0.17
Queue Length 95th (ft)	4	0	0	0	0	15
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	14.5
Lane LOS	A					B
Approach Delay (s)	0.9			0.0		14.5
Approach LOS						B

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	48.3%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	236	120	306	454	15	132	0	231	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00		1.00		0.85	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)	1630	3096		1630	3244		3162		1458	1630	1625	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3096		1630	3244		3162		1458	1630	1625	
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)	9	257	130	333	493	16	143	0	251	10	33	18
RTOR Reduction (vph)	0	49	0	0	1	0	0	0	150	0	17	0
Lane Group Flow (vph)	9	338	0	333	508	0	143	0	101	10	34	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	0.7	31.6		20.0	50.9		8.0		32.0	4.0	4.0	
Effective Green, g (s)	0.7	31.6		20.0	50.9		8.0		32.0	4.0	4.0	
Actuated g/C Ratio	0.01	0.40		0.25	0.64		0.10		0.40	0.05	0.05	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	14	1229		410	2074		318		586	82	82	
v/s Ratio Prot	0.01	c0.11		c0.20	0.16		c0.05		0.07	0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.64	0.28		0.81	0.24		0.45		0.17	0.12	0.41	
Uniform Delay, d1	39.3	16.2		28.0	6.1		33.7		15.3	36.1	36.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	56.8	0.6		11.0	0.3		0.4		0.1	0.2	1.2	
Delay (s)	96.1	16.8		39.1	6.4		34.1		15.3	36.4	37.9	
Level of Service	F	B		D	A		C		B	D	D	
Approach Delay (s)		18.6			19.3			22.1			37.6	
Approach LOS		B			B			C			D	

Intersection Summary				
HCM Average Control Delay	20.5	HCM Level of Service		C
HCM Volume to Capacity ratio	0.48			
Actuated Cycle Length (s)	79.6	Sum of lost time (s)		16.0
Intersection Capacity Utilization	50.4%	ICU Level of Service		A
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
7: U.S. 101 SB Ramps & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	438	0	0	370	0	0	0	137	0	0	444
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
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)	0	476	0	0	402	0	0	0	149	0	0	483
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.94			0.94	0.94	0.94	0.94	0.94	
vC, conflicting volume	402			476			1361	878	476	1027	878	402
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	402			406			1351	836	406	995	836	402
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	75	100	100	26
cM capacity (veh/h)	1156			1079			30	284	603	158	284	648

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	476	402	149	483
Volume Left	0	0	0	0
Volume Right	0	0	149	483
cSH	1700	1700	603	648
Volume to Capacity	0.28	0.24	0.25	0.74
Queue Length 95th (ft)	0	0	24	166
Control Delay (s)	0.0	0.0	12.9	24.9
Lane LOS			B	C
Approach Delay (s)	0.0	0.0	12.9	24.9
Approach LOS			B	C

Intersection Summary				
Average Delay	9.2			
Intersection Capacity Utilization	57.7%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: U.S. 101 NB Ramps & Talmage Road

6/21/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	272	0	0	281	89	27
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	296	0	0	305	97	29
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			296		601	296
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			296		601	296
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		79	96
cM capacity (veh/h)			1266		463	744

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	296	305	126
Volume Left	0	0	97
Volume Right	0	0	29
cSH	1700	1700	604
Volume to Capacity	0.17	0.18	0.21
Queue Length 95th (ft)	0	0	20
Control Delay (s)	0.0	0.0	13.7
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.7
Approach LOS			B

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Hastings Frontage Road & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	23	288	6	2	354	20	16	2	6	25	3	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	25	313	7	2	385	22	17	2	7	27	3	28
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	407			320			796	777	316	774	770	396
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	407			320			796	777	316	774	770	396
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			94	99	99	91	99	96
cM capacity (veh/h)	1152			1240			284	320	724	306	324	654

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	345	409	26	59
Volume Left	25	2	17	27
Volume Right	7	22	7	28
cSH	1152	1240	339	413
Volume to Capacity	0.02	0.00	0.08	0.14
Queue Length 95th (ft)	2	0	6	12
Control Delay (s)	0.8	0.1	16.5	15.2
Lane LOS	A	A	C	C
Approach Delay (s)	0.8	0.1	16.5	15.2
Approach LOS			C	C

Intersection Summary					
Average Delay			1.9		
Intersection Capacity Utilization			45.1%	ICU Level of Service	A
Analysis Period (min)			15		

AM Peak Hour - Existing plus Project
Costco Traffic & Circulation Report
City of Ukiah

Level Of Service Computation Report
2000 HM 4-Way Stop Method (Future Volume Alternative)

Intersection #10 Airport Park Blvd/Hastings Ave-Commerce Dr

Cycle (sec): 100 Critical Vol./Cap.(X): 0.365
Loss Time (sec): 0 Average Delay (sec/veh): 10.2
Optimal Cycle: 0 Level Of Service: B

Street Name:	Airport Park Blvd						Hastings Ave-Commerce Dr					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0 1	1 0	1	0 1	1 0	0	0 1!	0 0	0	0 1!	0 0
Volume Module: >> Count Date: 10 Feb 2010 << 8:00 - 9:00 am												
Base Vol:	28	129	5	36	170	71	56	54	58	1	21	28
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	28	129	5	36	170	71	56	54	58	1	21	28
Added Vol:	20	33	0	0	56	0	0	0	35	0	0	0
PasserByVol:	2	23	1	-2	38	-3	-2	0	2	1	0	-1
Initial Fut:	50	185	6	34	264	68	54	54	95	2	21	27
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
PHF Volume:	58	213	7	39	304	78	62	62	109	2	24	31
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	58	213	7	39	304	78	62	62	109	2	24	31
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	58	213	7	39	304	78	62	62	109	2	24	31
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.94	0.06	1.00	1.59	0.41	0.26	0.27	0.47	0.04	0.42	0.54
Final Sat.:	552	1163	38	571	1007	267	170	170	299	23	246	317
Capacity Analysis Module:												
Vol/Sat:	0.10	0.18	0.18	0.07	0.30	0.29	0.37	0.37	0.37	0.10	0.10	0.10
Crit Moves:		****			****			****				****
Delay/Veh:	9.7	9.7	9.6	9.3	10.5	10.1	11.1	11.1	11.1	9.1	9.1	9.1
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.7	9.7	9.6	9.3	10.5	10.1	11.1	11.1	11.1	9.1	9.1	9.1
LOS by Move:	A	A	A	A	B	B	B	B	B	A	A	A
ApproachDel:		9.7			10.3			11.1			9.1	
Delay Adj:		1.00			1.00			1.00			1.00	
ApprAdjDel:		9.7			10.3			11.1			9.1	
LOS by Appr:		A			B			B			A	
AllWayAvgQ:	0.1	0.2	0.2	0.1	0.4	0.4	0.5	0.5	0.5	0.1	0.1	0.1

HCM Signalized Intersection Capacity Analysis
1: State Street & Mill Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	69	82	13	70	7	57	761	13	8	704	38
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.95			0.99			1.00			0.99	
Flt Protected		0.99			0.99			1.00			1.00	
Satd. Flow (prot)		1602			1685			3241			3233	
Flt Permitted		0.91			0.95			0.86			0.94	
Satd. Flow (perm)		1472			1618			2786			3054	
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)	62	75	89	14	76	8	62	827	14	9	765	41
RTOR Reduction (vph)	0	52	0	0	5	0	0	3	0	0	10	0
Lane Group Flow (vph)	0	174	0	0	93	0	0	900	0	0	805	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		589			647			1114			1222	
v/s Ratio Prot												
v/s Ratio Perm		c0.12			0.06			c0.32			0.26	
v/c Ratio		0.30			0.14			0.81			0.66	
Uniform Delay, d1		8.2			7.6			10.6			9.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.3			0.5			6.3			2.8	
Delay (s)		9.4			8.1			17.0			12.6	
Level of Service		A			A			B			B	
Approach Delay (s)		9.4			8.1			17.0			12.6	
Approach LOS		A			A			B			B	

Intersection Summary				
HCM Average Control Delay	14.0	HCM Level of Service		B
HCM Volume to Capacity ratio	0.55			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)		8.0
Intersection Capacity Utilization	77.3%	ICU Level of Service		D
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: State Street & Gobbi Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	219	70	209	192	60	97	666	140	108	697	43
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.96		1.00	0.96		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)	1630	1653		1630	1655		1630	3175		1630	3231	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1653		1630	1655		1630	3175		1630	3231	
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	238	76	227	209	65	105	724	152	117	758	47
RTOR Reduction (vph)	0	12	0	0	10	0	0	20	0	0	5	0
Lane Group Flow (vph)	95	302	0	227	264	0	105	856	0	117	800	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	9.1	24.0		15.8	30.7		7.7	25.5		7.9	25.7	
Effective Green, g (s)	9.1	24.0		15.8	30.7		7.7	25.5		7.9	25.7	
Actuated g/C Ratio	0.10	0.27		0.18	0.34		0.09	0.29		0.09	0.29	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	166	445		289	570		141	908		144	931	
v/s Ratio Prot	0.06	c0.18		c0.14	0.16		0.06	c0.27		0.07	c0.25	
v/s Ratio Perm												
v/c Ratio	0.57	0.68		0.79	0.46		0.74	0.94		0.81	0.86	
Uniform Delay, d1	38.2	29.1		35.1	22.8		39.8	31.1		39.9	30.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.7	8.1		13.1	2.7		19.0	17.6		28.2	8.0	
Delay (s)	42.9	37.2		48.2	25.5		58.8	48.7		68.2	38.0	
Level of Service	D	D		D	C		E	D		E	D	
Approach Delay (s)		38.5			35.8			49.8			41.8	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM Average Control Delay	43.0	HCM Level of Service		D
HCM Volume to Capacity ratio	0.80			
Actuated Cycle Length (s)	89.2	Sum of lost time (s)		12.0
Intersection Capacity Utilization	74.4%	ICU Level of Service		D
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: State Street & Talmage Road

6/21/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	308	291	474	251	326	486
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.95			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3090			3196
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3090			3196
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	335	316	515	273	354	528
RTOR Reduction (vph)	0	232	60	0	0	0
Lane Group Flow (vph)	335	84	728	0	0	882
Turn Type	NA	Perm	NA		Split	NA
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	25.8	25.8	26.2			30.5
Effective Green, g (s)	25.8	25.8	26.2			30.5
Actuated g/C Ratio	0.27	0.27	0.27			0.32
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	436	390	839			1010
v/s Ratio Prot	c0.21		c0.24			c0.28
v/s Ratio Perm		0.06				
v/c Ratio	0.77	0.22	0.87			0.87
Uniform Delay, d1	32.6	27.5	33.5			31.2
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	7.9	0.3	9.1			8.2
Delay (s)	40.5	27.8	42.6			39.4
Level of Service	D	C	D			D
Approach Delay (s)	34.3		42.6			39.4
Approach LOS	C		D			D

Intersection Summary				
HCM Average Control Delay	39.1	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.84			
Actuated Cycle Length (s)	96.5	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	78.0%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: State Street & Washington Avenue/Hastings Avenue

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	63	26	98	51	137	33	492	92	154	535	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.99			0.94		1.00	0.98		1.00	0.97	
Flt Protected		0.97			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1639			1578		1630	1675		1630	3159	
Flt Permitted		0.55			0.81		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		937			1303		1630	1675		1630	3159	
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)	165	68	28	107	55	149	36	535	100	167	582	152
RTOR Reduction (vph)	0	5	0	0	37	0	0	8	0	0	24	0
Lane Group Flow (vph)	0	256	0	0	274	0	36	627	0	167	710	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		25.0			25.0		3.6	48.6		6.0	51.0	
Effective Green, g (s)		25.0			25.0		3.6	48.6		6.0	51.0	
Actuated g/C Ratio		0.27			0.27		0.04	0.53		0.07	0.56	
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)		256			356		64	889		107	1759	
v/s Ratio Prot							0.02	c0.37		c0.10	0.22	
v/s Ratio Perm		c0.27			0.21							
v/c Ratio		1.00			0.77		0.56	0.71		1.56	0.40	
Uniform Delay, d1		33.3			30.6		43.2	16.1		42.8	11.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		55.7			9.6		10.8	4.7		292.7	0.7	
Delay (s)		89.0			40.3		54.1	20.8		335.5	12.3	
Level of Service		F			D		D	C		F	B	
Approach Delay (s)		89.0			40.3			22.6			72.2	
Approach LOS		F			D			C			E	

Intersection Summary				
HCM Average Control Delay	54.1	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	91.6	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	79.1%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	88	721	0	0	731	89	0	0	0	60	0	82
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	96	784	0	0	795	97	0	0	0	65	0	89
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.90						0.90	0.90		0.90	0.90	0.90
vC, conflicting volume	891			784			1859	1866	392	1378	1770	795
vC1, stage 1 conf vol							975	975		795	795	
vC2, stage 2 conf vol							884	891		583	975	
vCu, unblocked vol	822			784			1900	1908	392	1364	1800	714
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			100	100	100	76	100	74
cM capacity (veh/h)	733			830			111	190	607	274	231	340

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	96	392	392	795	97	154
Volume Left	96	0	0	0	0	65
Volume Right	0	0	0	0	97	89
cSH	733	1700	1700	1700	1700	308
Volume to Capacity	0.13	0.23	0.23	0.47	0.06	0.50
Queue Length 95th (ft)	11	0	0	0	0	66
Control Delay (s)	10.6	0.0	0.0	0.0	0.0	27.8
Lane LOS	B					D
Approach Delay (s)	1.2			0.0		27.8
Approach LOS						D

Intersection Summary				
Average Delay	2.8			
Intersection Capacity Utilization	66.1%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	366	329	574	434	14	312	0	681	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00		1.00		0.85	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)	1630	3028		1630	3245		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3028		1630	3245		3162		1458	1630	1629	
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)	15	398	358	624	472	15	339	0	740	14	51	26
RTOR Reduction (vph)	0	144	0	0	2	0	0	0	245	0	20	0
Lane Group Flow (vph)	15	612	0	624	485	0	339	0	495	14	57	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	1.5	28.8		26.3	53.6		15.4		45.7	6.6	6.6	
Effective Green, g (s)	1.5	28.8		26.3	53.6		15.4		45.7	6.6	6.6	
Actuated g/C Ratio	0.02	0.31		0.28	0.58		0.17		0.49	0.07	0.07	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	26	937		460	1868		523		716	116	115	
v/s Ratio Prot	0.01	c0.20		c0.38	0.15		0.11		c0.34	0.01	c0.04	
v/s Ratio Perm												
v/c Ratio	0.58	0.65		1.36	0.26		0.65		0.69	0.12	0.50	
Uniform Delay, d1	45.5	27.8		33.4	9.9		36.3		18.3	40.5	41.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	17.8	3.5		174.2	0.3		2.1		2.3	0.2	1.2	
Delay (s)	63.3	31.4		207.6	10.2		38.4		20.6	40.7	42.9	
Level of Service	E	C		F	B		D		C	D	D	
Approach Delay (s)		32.0			121.0			26.2			42.6	
Approach LOS		C			F			C			D	

Intersection Summary				
HCM Average Control Delay	62.7	HCM Level of Service	E	
HCM Volume to Capacity ratio	0.90			
Actuated Cycle Length (s)	93.1	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	83.3%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
7: U.S. 101 SB Ramps & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑				↱			↱
Volume (veh/h)	0	991	0	0	434	0	0	0	177	0	0	644
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
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)	0	1077	0	0	472	0	0	0	192	0	0	700
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.80			0.80	0.80	0.80	0.80	0.80	
vC, conflicting volume	472			1077			2249	1549	1077	1741	1549	472
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	472			974			2431	1561	974	1800	1561	472
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			0	100	22	100	100	0
cM capacity (veh/h)	1090			569			0	90	246	11	90	592

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1077	472	192	700
Volume Left	0	0	0	0
Volume Right	0	0	192	700
cSH	1700	1700	246	592
Volume to Capacity	0.63	0.28	0.78	1.18
Queue Length 95th (ft)	0	0	145	607
Control Delay (s)	0.0	0.0	57.8	122.1
Lane LOS			F	F
Approach Delay (s)	0.0	0.0	57.8	122.1
Approach LOS			F	F

Intersection Summary				
Average Delay	39.6			
Intersection Capacity Utilization	75.2%	ICU Level of Service	D	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: U.S. 101 NB Ramps & Talmage Road

6/21/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↰	↱
Volume (veh/h)	452	0	0	300	135	45
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	491	0	0	326	147	49
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			491		817	491
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			491		817	491
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		58	92
cM capacity (veh/h)			1072		346	577

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	491	326	196
Volume Left	0	0	147
Volume Right	0	0	49
cSH	1700	1700	423
Volume to Capacity	0.29	0.19	0.46
Queue Length 95th (ft)	0	0	60
Control Delay (s)	0.0	0.0	20.6
Lane LOS			C
Approach Delay (s)	0.0	0.0	20.6
Approach LOS			C

Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	76.7%	ICU Level of Service	D	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
9: Hastings Frontage Road & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	51	444	18	2	416	18	19	3	2	31	2	28
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	55	483	20	2	452	20	21	3	2	34	2	30
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	472			502			1101	1079	492	1073	1079	462
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	472			502			1101	1079	492	1073	1079	462
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			88	98	100	82	99	95
cM capacity (veh/h)	1090			1062			171	207	576	187	207	600

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	558	474	26	66
Volume Left	55	2	21	34
Volume Right	20	20	2	30
cSH	1090	1062	186	274
Volume to Capacity	0.05	0.00	0.14	0.24
Queue Length 95th (ft)	4	0	12	23
Control Delay (s)	1.4	0.1	27.5	22.3
Lane LOS	A	A	D	C
Approach Delay (s)	1.4	0.1	27.5	22.3
Approach LOS			D	C

Intersection Summary						
Average Delay			2.7			
Intersection Capacity Utilization			68.5%	ICU Level of Service		C
Analysis Period (min)			15			

PM Peak Hour - Existing plus Project
Costco Traffic & Circulation Report
City of Ukiah

Level Of Service Computation Report
2000 HM 4-Way Stop Method (Future Volume Alternative)

Intersection #10 Airport Park Blvd/Hastings Ave-Commerce Dr

Cycle (sec): 100 Critical Vol./Cap.(X): 0.786
Loss Time (sec): 0 Average Delay (sec/veh): 27.0
Optimal Cycle: 0 Level Of Service: D

Street Name:	Airport Park Blvd						Hastings Ave-Commerce Dr					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0 1	1 0	1	0 1	1 0	0	0 1!	0 0	0	0 1!	0 0
Volume Module: >> Count Date: 10 Feb 2010 << 4:15 - 5:15 pm												
Base Vol:	79	268	8	66	188	79	79	79	79	4	50	73
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	79	268	8	66	188	79	79	79	79	4	50	73
Added Vol:	136	221	0	0	213	0	0	0	130	0	0	0
PasserByVol:	7	152	6	-6	146	-7	-7	0	7	6	0	-6
Initial Fut:	222	641	14	60	547	72	72	79	216	10	50	67
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
PHF Volume:	238	687	15	64	586	77	77	85	232	11	54	72
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	238	687	15	64	586	77	77	85	232	11	54	72
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	238	687	15	64	586	77	77	85	232	11	54	72
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.96	0.04	1.00	1.77	0.23	0.20	0.21	0.59	0.08	0.39	0.53
Final Sat.:	438	916	20	420	802	107	98	108	295	33	163	219
Capacity Analysis Module:												
Vol/Sat:	0.54	0.75	0.75	0.15	0.73	0.72	0.79	0.79	0.79	0.33	0.33	0.33
Crit Moves:		****			****				****		****	
Delay/Veh:	20.0	29.5	29.4	12.6	28.6	27.7	30.4	30.4	30.4	14.7	14.7	14.7
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	20.0	29.5	29.4	12.6	28.6	27.7	30.4	30.4	30.4	14.7	14.7	14.7
LOS by Move:	C	D	D	B	D	D	D	D	D	B	B	B
ApproachDel:		27.1			27.1			30.4			14.7	
Delay Adj:		1.00			1.00			1.00			1.00	
ApprAdjDel:		27.1			27.1			30.4			14.7	
LOS by Appr:		D			D			D			B	
AllWayAvgQ:	1.1	2.5	2.5	0.2	2.3	2.2	2.8	2.8	2.8	0.4	0.4	0.4

HCM Signalized Intersection Capacity Analysis
1: State Street & Mill Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	67	65	3	65	9	47	425	8	8	332	22
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.95			0.98			1.00			0.99	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		1610			1685			3236			3226	
Flt Permitted		0.93			0.99			0.89			0.94	
Satd. Flow (perm)		1511			1674			2894			3045	
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)	45	73	71	3	71	10	51	462	9	9	361	24
RTOR Reduction (vph)	0	43	0	0	6	0	0	3	0	0	12	0
Lane Group Flow (vph)	0	146	0	0	78	0	0	519	0	0	382	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		604			670			1158			1218	
v/s Ratio Prot												
v/s Ratio Perm		c0.10			0.05			c0.18			0.13	
v/c Ratio		0.24			0.12			0.45			0.31	
Uniform Delay, d1		8.0			7.6			8.8			8.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.0			0.4			1.3			0.7	
Delay (s)		8.9			7.9			10.0			8.9	
Level of Service		A			A			B			A	
Approach Delay (s)		8.9			7.9			10.0			8.9	
Approach LOS		A			A			B			A	

Intersection Summary				
HCM Average Control Delay	9.3	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.35			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	52.8%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: State Street & Gobbi Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	203	60	103	230	46	37	443	92	51	353	23
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.97		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)	1630	1657		1630	1673		1630	3176		1630	3230	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1657		1630	1673		1630	3176		1630	3230	
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	221	65	112	250	50	40	482	100	55	384	25
RTOR Reduction (vph)	0	10	0	0	6	0	0	20	0	0	5	0
Lane Group Flow (vph)	66	276	0	112	294	0	40	562	0	55	404	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	6.8	24.8		8.6	26.6		4.3	18.1		3.6	17.4	
Effective Green, g (s)	6.8	24.8		8.6	26.6		4.3	18.1		3.6	17.4	
Actuated g/C Ratio	0.10	0.35		0.12	0.37		0.06	0.25		0.05	0.24	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	156	578		197	626		99	809		83	790	
v/s Ratio Prot	0.04	0.17		c0.07	c0.18		0.02	c0.18		0.03	c0.12	
v/s Ratio Perm												
v/c Ratio	0.42	0.48		0.57	0.47		0.40	0.69		0.66	0.51	
Uniform Delay, d1	30.3	18.1		29.5	16.9		32.2	24.0		33.2	23.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	2.8		3.7	2.5		2.7	2.6		18.1	0.6	
Delay (s)	32.1	20.9		33.2	19.4		34.9	26.6		51.3	23.7	
Level of Service	C	C		C	B		C	C		D	C	
Approach Delay (s)		23.0			23.2			27.1			27.0	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM Average Control Delay	25.4	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	71.1	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	54.9%	ICU Level of Service	A	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: State Street & Talmage Road

6/21/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	306	243	323	180	225	296
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.95			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3085			3191
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3085			3191
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	333	264	351	196	245	322
RTOR Reduction (vph)	0	183	70	0	0	0
Lane Group Flow (vph)	333	81	477	0	0	567
Turn Type	NA	Perm	NA		Split	NA
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	21.9	21.9	16.8			18.6
Effective Green, g (s)	21.9	21.9	16.8			18.6
Actuated g/C Ratio	0.31	0.31	0.24			0.26
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	501	448	727			832
v/s Ratio Prot	c0.20		c0.15			c0.18
v/s Ratio Perm		0.06				
v/c Ratio	0.66	0.18	0.66			0.68
Uniform Delay, d1	21.5	18.1	24.6			23.7
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	3.3	0.2	1.6			1.8
Delay (s)	24.8	18.3	26.3			25.5
Level of Service	C	B	C			C
Approach Delay (s)	21.9		26.3			25.5
Approach LOS	C		C			C

Intersection Summary				
HCM Average Control Delay	24.5	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	71.3	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	62.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: State Street & Washington Avenue/Hastings Avenue

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	181	118	50	46	50	81	34	497	52	85	482	158
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.98		1.00	0.91		1.00	0.99		1.00	0.96	
Flt Protected		0.97		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1640		1630	1556		1630	1691		1630	3139	
Flt Permitted		0.71		0.53	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1196		904	1556		1630	1691		1630	3139	
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)	197	128	54	50	54	88	37	540	57	92	524	172
RTOR Reduction (vph)	0	7	0	0	64	0	0	4	0	0	33	0
Lane Group Flow (vph)	0	372	0	50	78	0	37	593	0	92	663	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		25.0		25.0	25.0		3.6	48.6		6.0	51.0	
Effective Green, g (s)		25.0		25.0	25.0		3.6	48.6		6.0	51.0	
Actuated g/C Ratio		0.27		0.27	0.27		0.04	0.53		0.07	0.56	
Clearance Time (s)		4.0		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	3.0	
Lane Grp Cap (vph)		326		247	425		64	897		107	1748	
v/s Ratio Prot					0.05		0.02	c0.35		c0.06	0.21	
v/s Ratio Perm		c0.31		0.06								
v/c Ratio		1.14		0.20	0.18		0.58	0.66		0.86	0.38	
Uniform Delay, d1		33.3		25.6	25.5		43.3	15.5		42.4	11.4	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		94.2		0.4	0.2		12.0	3.8		45.5	0.6	
Delay (s)		127.5		26.0	25.7		55.3	19.4		87.9	12.0	
Level of Service		F		C	C		E	B		F	B	
Approach Delay (s)		127.5			25.8			21.5			20.9	
Approach LOS		F			C			C			C	

Intersection Summary				
HCM Average Control Delay	41.8	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.82			
Actuated Cycle Length (s)	91.6	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	79.4%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	41	359	0	0	547	39	0	0	0	27	0	45
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	45	390	0	0	595	42	0	0	0	29	0	49
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.90						0.90	0.90		0.90	0.90	0.90
vC, conflicting volume	637			390			1123	1116	195	879	1074	595
vC1, stage 1 conf vol							479	479		595	595	
vC2, stage 2 conf vol							643	637		284	479	
vCu, unblocked vol	544			390			1082	1075	195	812	1028	497
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			100	100	100	93	100	90
cM capacity (veh/h)	934			1165			305	362	813	428	395	473

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	45	195	195	595	42	78
Volume Left	45	0	0	0	0	29
Volume Right	0	0	0	0	42	49
cSH	934	1700	1700	1700	1700	455
Volume to Capacity	0.05	0.11	0.11	0.35	0.02	0.17
Queue Length 95th (ft)	4	0	0	0	0	15
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	14.6
Lane LOS	A					B
Approach Delay (s)	0.9			0.0		14.6
Approach LOS						B

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	48.3%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	239	121	325	457	15	133	0	243	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00		1.00		0.85	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)	1630	3095		1630	3245		3162		1458	1630	1625	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3095		1630	3245		3162		1458	1630	1625	
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)	9	260	132	353	497	16	145	0	264	10	33	18
RTOR Reduction (vph)	0	50	0	0	1	0	0	0	154	0	17	0
Lane Group Flow (vph)	9	342	0	353	512	0	145	0	110	10	34	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	0.7	31.1		21.4	51.8		8.1		33.5	4.0	4.0	
Effective Green, g (s)	0.7	31.1		21.4	51.8		8.1		33.5	4.0	4.0	
Actuated g/C Ratio	0.01	0.39		0.27	0.64		0.10		0.42	0.05	0.05	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	14	1194		433	2085		318		606	81	81	
v/s Ratio Prot	0.01	c0.11		c0.22	0.16		c0.05		0.08	0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.64	0.29		0.82	0.25		0.46		0.18	0.12	0.42	
Uniform Delay, d1	39.8	17.1		27.7	6.1		34.2		14.9	36.6	37.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	56.8	0.6		10.7	0.3		0.4		0.1	0.3	1.3	
Delay (s)	96.6	17.7		38.4	6.4		34.6		14.9	36.9	38.4	
Level of Service	F	B		D	A		C		B	D	D	
Approach Delay (s)		19.5			19.5			21.9			38.2	
Approach LOS		B			B			C			D	

Intersection Summary				
HCM Average Control Delay	20.7	HCM Level of Service		C
HCM Volume to Capacity ratio	0.49			
Actuated Cycle Length (s)	80.6	Sum of lost time (s)		16.0
Intersection Capacity Utilization	51.7%	ICU Level of Service		A
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
7: U.S. 101 SB Ramps & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑				↱			↱
Volume (veh/h)	0	452	0	0	384	0	0	0	141	0	0	457
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
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)	0	491	0	0	417	0	0	0	153	0	0	497
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.93			0.93	0.93	0.93	0.93	0.93	
vC, conflicting volume	417			491			1405	909	491	1062	909	417
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	417			418			1399	866	418	1030	866	417
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	74	100	100	22
cM capacity (veh/h)	1142			1064			24	272	592	146	272	635

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	491	417	153	497
Volume Left	0	0	0	0
Volume Right	0	0	153	497
cSH	1700	1700	592	635
Volume to Capacity	0.29	0.25	0.26	0.78
Queue Length 95th (ft)	0	0	26	187
Control Delay (s)	0.0	0.0	13.2	27.9
Lane LOS			B	D
Approach Delay (s)	0.0	0.0	13.2	27.9
Approach LOS			B	D

Intersection Summary				
Average Delay	10.2			
Intersection Capacity Utilization	59.3%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: U.S. 101 NB Ramps & Talmage Road

6/21/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↰	↱
Volume (veh/h)	281	0	0	293	92	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	305	0	0	318	100	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			305		624	305
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			305		624	305
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		78	96
cM capacity (veh/h)			1255		449	734

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	305	318	133
Volume Left	0	0	100
Volume Right	0	0	33
cSH	1700	1700	596
Volume to Capacity	0.18	0.19	0.22
Queue Length 95th (ft)	0	0	21
Control Delay (s)	0.0	0.0	14.0
Lane LOS			B
Approach Delay (s)	0.0	0.0	14.0
Approach LOS			B

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	40.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
9: Hastings Frontage Road & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	23	293	9	4	361	20	19	3	8	25	4	27
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	25	318	10	4	392	22	21	3	9	27	4	29
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	414			328			817	796	323	796	790	403
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	414			328			817	796	323	796	790	403
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			92	99	99	91	99	95
cM capacity (veh/h)	1145			1231			274	312	718	293	314	647

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	353	418	33	61
Volume Left	25	4	21	27
Volume Right	10	22	9	29
cSH	1145	1231	332	401
Volume to Capacity	0.02	0.00	0.10	0.15
Queue Length 95th (ft)	2	0	8	13
Control Delay (s)	0.8	0.1	17.0	15.6
Lane LOS	A	A	C	C
Approach Delay (s)	0.8	0.1	17.0	15.6
Approach LOS			C	C

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	43.8%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
10: Airport Park Boulevard & Commerce Drive

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	54	110	2	21	27	60	195	6	34	281	68
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.93			0.93		1.00	1.00		1.00	0.97	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1580			1588		1630	3244		1630	3164	
Flt Permitted		0.89			0.98		0.53	1.00		0.61	1.00	
Satd. Flow (perm)		1432			1562		904	3244		1055	3164	
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)	62	59	120	2	23	29	65	212	7	37	305	74
RTOR Reduction (vph)	0	90	0	0	22	0	0	4	0	0	41	0
Lane Group Flow (vph)	0	151	0	0	32	0	65	215	0	37	338	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		6.7			6.7		12.0	12.0		12.0	12.0	
Effective Green, g (s)		6.7			6.7		12.0	12.0		12.0	12.0	
Actuated g/C Ratio		0.25			0.25		0.45	0.45		0.45	0.45	
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)		359			392		406	1458		474	1422	
v/s Ratio Prot								0.07			c0.11	
v/s Ratio Perm		c0.11			0.02		0.07			0.04		
v/c Ratio		0.42			0.08		0.16	0.15		0.08	0.24	
Uniform Delay, d1		8.4			7.6		4.4	4.3		4.2	4.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			0.1		0.2	0.0		0.1	0.1	
Delay (s)		9.2			7.7		4.5	4.4		4.3	4.6	
Level of Service		A			A		A	A		A	A	
Approach Delay (s)		9.2			7.7			4.4			4.6	
Approach LOS		A			A			A			A	

Intersection Summary						
HCM Average Control Delay	5.8	HCM Level of Service		A		
HCM Volume to Capacity ratio	0.30					
Actuated Cycle Length (s)	26.7	Sum of lost time (s)		8.0		
Intersection Capacity Utilization	44.9%	ICU Level of Service		A		
Analysis Period (min)	15					
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
1: State Street & Mill Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	69	88	14	70	7	61	779	13	8	728	38
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.94			0.99			1.00			0.99	
Flt Protected		0.99			0.99			1.00			1.00	
Satd. Flow (prot)		1599			1684			3241			3234	
Flt Permitted		0.91			0.95			0.85			0.94	
Satd. Flow (perm)		1472			1611			2758			3055	
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)	62	75	96	15	76	8	66	847	14	9	791	41
RTOR Reduction (vph)	0	47	0	0	5	0	0	2	0	0	9	0
Lane Group Flow (vph)	0	186	0	0	94	0	0	925	0	0	832	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		589			644			1103			1222	
v/s Ratio Prot												
v/s Ratio Perm		c0.13			0.06			c0.34			0.27	
v/c Ratio		0.32			0.15			0.84			0.68	
Uniform Delay, d1		8.2			7.6			10.8			9.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.4			0.5			7.7			3.1	
Delay (s)		9.6			8.1			18.5			13.0	
Level of Service		A			A			B			B	
Approach Delay (s)		9.6			8.1			18.5			13.0	
Approach LOS		A			A			B			B	

Intersection Summary				
HCM Average Control Delay	14.8	HCM Level of Service		B
HCM Volume to Capacity ratio	0.58			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)		8.0
Intersection Capacity Utilization	79.0%	ICU Level of Service		D
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: State Street & Gobbi Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	219	76	213	192	60	101	688	143	108	727	43
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.96		1.00	0.96		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)	1630	1649		1630	1655		1630	3176		1630	3232	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1649		1630	1655		1630	3176		1630	3232	
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	238	83	232	209	65	110	748	155	117	790	47
RTOR Reduction (vph)	0	14	0	0	11	0	0	19	0	0	4	0
Lane Group Flow (vph)	95	307	0	232	263	0	110	884	0	117	833	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	9.1	23.8		16.0	30.7		7.8	26.0		7.9	26.1	
Effective Green, g (s)	9.1	23.8		16.0	30.7		7.8	26.0		7.9	26.1	
Actuated g/C Ratio	0.10	0.27		0.18	0.34		0.09	0.29		0.09	0.29	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	165	438		291	566		142	921		144	940	
v/s Ratio Prot	0.06	c0.19		c0.14	0.16		0.07	c0.28		0.07	c0.26	
v/s Ratio Perm												
v/c Ratio	0.58	0.70		0.80	0.47		0.77	0.96		0.81	0.89	
Uniform Delay, d1	38.5	29.7		35.3	23.1		40.1	31.3		40.2	30.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	9.0		14.0	2.7		22.7	20.2		28.2	10.0	
Delay (s)	43.3	38.8		49.3	25.8		62.8	51.6		68.4	40.4	
Level of Service	D	D		D	C		E	D		E	D	
Approach Delay (s)		39.8			36.6			52.8			43.9	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM Average Control Delay	45.1	HCM Level of Service		D
HCM Volume to Capacity ratio	0.82			
Actuated Cycle Length (s)	89.7	Sum of lost time (s)		12.0
Intersection Capacity Utilization	75.8%	ICU Level of Service		D
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: State Street & Talmage Road

6/21/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	310	297	496	253	339	514
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.95			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3095			3196
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3095			3196
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	337	323	539	275	368	559
RTOR Reduction (vph)	0	237	55	0	0	0
Lane Group Flow (vph)	337	86	759	0	0	927
Turn Type	NA	Perm	NA		Split	NA
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	26.2	26.2	27.6			30.5
Effective Green, g (s)	26.2	26.2	27.6			30.5
Actuated g/C Ratio	0.27	0.27	0.28			0.31
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	434	389	869			992
v/s Ratio Prot	c0.21		c0.25			c0.29
v/s Ratio Perm		0.06				
v/c Ratio	0.78	0.22	0.87			0.93
Uniform Delay, d1	33.3	28.1	33.7			32.9
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	8.5	0.3	9.4			15.0
Delay (s)	41.8	28.4	43.0			47.9
Level of Service	D	C	D			D
Approach Delay (s)	35.2		43.0			47.9
Approach LOS	D		D			D

Intersection Summary				
HCM Average Control Delay	42.8	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.87			
Actuated Cycle Length (s)	98.3	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	80.1%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: State Street & Washington Avenue/Hastings Avenue

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	64	26	101	52	160	33	494	96	182	537	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.99		1.00	0.89		1.00	0.98		1.00	0.97	
Flt Protected		0.97		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1640		1630	1522		1630	1674		1630	3159	
Flt Permitted		0.54		0.61	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		906		1048	1522		1630	1674		1630	3159	
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)	165	70	28	110	57	174	36	537	104	198	584	152
RTOR Reduction (vph)	0	5	0	0	124	0	0	8	0	0	24	0
Lane Group Flow (vph)	0	258	0	110	107	0	36	633	0	198	712	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		26.2		26.2	26.2		3.6	40.7		12.0	49.1	
Effective Green, g (s)		26.2		26.2	26.2		3.6	40.7		12.0	49.1	
Actuated g/C Ratio		0.29		0.29	0.29		0.04	0.45		0.13	0.54	
Clearance Time (s)		4.0		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	3.0	
Lane Grp Cap (vph)		261		302	439		65	750		215	1706	
v/s Ratio Prot					0.07		0.02	c0.38		c0.12	0.23	
v/s Ratio Perm		c0.28		0.11								
v/c Ratio		0.99		0.36	0.24		0.55	0.84		0.92	0.42	
Uniform Delay, d1		32.2		25.7	24.8		42.9	22.3		39.0	12.4	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		52.0		0.7	0.3		9.8	11.2		40.0	0.8	
Delay (s)		84.2		26.5	25.1		52.7	33.5		79.0	13.2	
Level of Service		F		C	C		D	C		E	B	
Approach Delay (s)		84.2			25.5			34.5			27.1	
Approach LOS		F			C			C			C	

Intersection Summary				
HCM Average Control Delay	35.9	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.90			
Actuated Cycle Length (s)	90.9	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	87.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	88	736	0	0	739	89	0	0	0	61	0	82
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	96	800	0	0	803	97	0	0	0	66	0	89
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.89						0.89	0.89		0.89	0.89	0.89
vC, conflicting volume	900			800			1884	1891	400	1395	1795	803
vC1, stage 1 conf vol							991	991		803	803	
vC2, stage 2 conf vol							892	900		591	991	
vCu, unblocked vol	830			800			1929	1937	400	1382	1829	721
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			100	100	100	75	100	73
cM capacity (veh/h)	726			819			108	187	600	270	227	335

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	96	400	400	803	97	155
Volume Left	96	0	0	0	0	66
Volume Right	0	0	0	0	97	89
cSH	726	1700	1700	1700	1700	304
Volume to Capacity	0.13	0.24	0.24	0.47	0.06	0.51
Queue Length 95th (ft)	11	0	0	0	0	69
Control Delay (s)	10.7	0.0	0.0	0.0	0.0	28.7
Lane LOS	B					D
Approach Delay (s)	1.1			0.0		28.7
Approach LOS						D

Intersection Summary				
Average Delay	2.8			
Intersection Capacity Utilization	66.7%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road/Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	374	336	613	442	14	312	0	708	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00		1.00		0.85	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)	1630	3029		1630	3245		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3029		1630	3245		3162		1458	1630	1629	
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)	15	407	365	666	480	15	339	0	770	14	51	26
RTOR Reduction (vph)	0	144	0	0	2	0	0	0	242	0	20	0
Lane Group Flow (vph)	15	628	0	666	493	0	339	0	528	14	57	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	1.5	28.8		26.3	53.6		16.0		46.3	6.6	6.6	
Effective Green, g (s)	1.5	28.8		26.3	53.6		16.0		46.3	6.6	6.6	
Actuated g/C Ratio	0.02	0.31		0.28	0.57		0.17		0.49	0.07	0.07	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	26	931		458	1856		540		720	115	115	
v/s Ratio Prot	0.01	c0.21		c0.41	0.15		0.11		c0.36	0.01	c0.04	
v/s Ratio Perm												
v/c Ratio	0.58	0.67		1.45	0.27		0.63		0.73	0.12	0.50	
Uniform Delay, d1	45.8	28.4		33.7	10.1		36.1		18.8	40.8	42.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	17.8	3.9		216.3	0.4		1.6		3.3	0.2	1.2	
Delay (s)	63.6	32.3		250.0	10.5		37.7		22.2	41.0	43.2	
Level of Service	E	C		F	B		D		C	D	D	
Approach Delay (s)		32.9			147.9			26.9			42.9	
Approach LOS		C			F			C			D	

Intersection Summary				
HCM Average Control Delay	73.5	HCM Level of Service	E	
HCM Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	93.7	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	86.1%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
7: U.S. 101 SB Ramps & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑				↱			↱
Volume (veh/h)	0	1022	0	0	464	0	0	0	186	0	0	671
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
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)	0	1111	0	0	504	0	0	0	202	0	0	729
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.80			0.80	0.80	0.80	0.80	0.80	
vC, conflicting volume	504			1111			2345	1615	1111	1817	1615	504
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	504			1011			2561	1645	1011	1899	1645	504
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			0	100	13	100	100	0
cM capacity (veh/h)	1060			546			0	79	231	5	79	568

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1111	504	202	729
Volume Left	0	0	0	0
Volume Right	0	0	202	729
cSH	1700	1700	231	568
Volume to Capacity	0.65	0.30	0.87	1.29
Queue Length 95th (ft)	0	0	177	737
Control Delay (s)	0.0	0.0	75.3	163.7
Lane LOS			F	F
Approach Delay (s)	0.0	0.0	75.3	163.7
Approach LOS			F	F

Intersection Summary				
Average Delay	52.9			
Intersection Capacity Utilization	78.3%	ICU Level of Service	D	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: U.S. 101 NB Ramps & Talmage Road

6/21/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↰	↱
Volume (veh/h)	473	0	0	324	142	54
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	514	0	0	352	154	59
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			514		866	514
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			514		866	514
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		52	90
cM capacity (veh/h)			1051		324	560

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	514	352	213
Volume Left	0	0	154
Volume Right	0	0	59
cSH	1700	1700	406
Volume to Capacity	0.30	0.21	0.52
Queue Length 95th (ft)	0	0	74
Control Delay (s)	0.0	0.0	23.2
Lane LOS			C
Approach Delay (s)	0.0	0.0	23.2
Approach LOS			C

Intersection Summary				
Average Delay	4.6			
Intersection Capacity Utilization	79.2%	ICU Level of Service	D	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
9: Hastings Frontage Road & Talmage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	53	456	26	8	428	18	27	5	8	31	4	31
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	58	496	28	9	465	20	29	5	9	34	4	34
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	485			524			1153	1127	510	1129	1132	475
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	485			524			1153	1127	510	1129	1132	475
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			99			81	97	98	80	98	94
cM capacity (veh/h)	1078			1043			154	192	564	166	191	590

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	582	493	43	72
Volume Left	58	9	29	34
Volume Right	28	20	9	34
cSH	1078	1043	186	254
Volume to Capacity	0.05	0.01	0.23	0.28
Queue Length 95th (ft)	4	1	22	28
Control Delay (s)	1.4	0.2	30.2	24.7
Lane LOS	A	A	D	C
Approach Delay (s)	1.4	0.2	30.2	24.7
Approach LOS			D	C

Intersection Summary				
Average Delay			3.4	
Intersection Capacity Utilization			71.5%	ICU Level of Service
Analysis Period (min)			15	

HCM Signalized Intersection Capacity Analysis
10: Airport Park Boulevard & Commerce Drive

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	79	226	10	50	67	233	654	14	60	556	72
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.92			0.93		1.00	1.00		1.00	0.98	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1565			1587		1630	3250		1630	3204	
Flt Permitted		0.89			0.96		0.37	1.00		0.35	1.00	
Satd. Flow (perm)		1416			1532		634	3250		592	3204	
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	86	246	11	54	73	253	711	15	65	604	78
RTOR Reduction (vph)	0	101	0	0	49	0	0	3	0	0	23	0
Lane Group Flow (vph)	0	326	0	0	89	0	253	723	0	65	659	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		12.0			12.0		17.1	17.1		17.1	17.1	
Effective Green, g (s)		12.0			12.0		17.1	17.1		17.1	17.1	
Actuated g/C Ratio		0.32			0.32		0.46	0.46		0.46	0.46	
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)		458			496		292	1498		273	1477	
v/s Ratio Prot								0.22			0.21	
v/s Ratio Perm		c0.23			0.06		c0.40			0.11		
v/c Ratio		0.71			0.18		0.87	0.48		0.24	0.45	
Uniform Delay, d1		11.0			9.0		9.0	6.9		6.1	6.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		5.1			0.2		22.6	0.2		0.5	0.2	
Delay (s)		16.2			9.2		31.5	7.2		6.5	7.0	
Level of Service		B			A		C	A		A	A	
Approach Delay (s)		16.2			9.2			13.5			7.0	
Approach LOS		B			A			B			A	

Intersection Summary				
HCM Average Control Delay		11.6	HCM Level of Service	B
HCM Volume to Capacity ratio		0.80		
Actuated Cycle Length (s)		37.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization		74.7%	ICU Level of Service	D
Analysis Period (min)		15		
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: Mill Street & State Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	67	54	1	65	9	39	563	7	8	450	23
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.96			0.98			1.00			0.99	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		1619			1688			3244			3234	
Flt Permitted		0.90			1.00			0.90			0.95	
Satd. Flow (perm)		1485			1685			2940			3064	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	55	71	57	1	68	9	41	593	7	8	474	24
RTOR Reduction (vph)	0	27	0	0	6	0	0	1	0	0	6	0
Lane Group Flow (vph)	0	156	0	0	72	0	0	640	0	0	500	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		21.0			21.0			31.0			31.0	
Effective Green, g (s)		21.0			21.0			31.0			31.0	
Actuated g/C Ratio		0.35			0.35			0.52			0.52	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		520			590			1519			1583	
v/s Ratio Prot												
v/s Ratio Perm		c0.10			0.04			c0.22			0.16	
v/c Ratio		0.30			0.12			0.42			0.32	
Uniform Delay, d1		14.2			13.2			9.0			8.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.5			0.4			0.9			0.5	
Delay (s)		15.6			13.7			9.8			8.9	
Level of Service		B			B			A			A	
Approach Delay (s)		15.6			13.7			9.8			8.9	
Approach LOS		B			B			A			A	

Intersection Summary				
HCM Average Control Delay	10.5	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.37			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	60.1%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Gobbi Street & State Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	115	211	97	97	231	46	37	509	86	51	452	32
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.98		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)	1630	1635		1630	1673		1630	3189		1630	3227	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1635		1630	1673		1630	3189		1630	3227	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	121	222	102	102	243	48	39	536	91	54	476	34
RTOR Reduction (vph)	0	26	0	0	12	0	0	23	0	0	9	0
Lane Group Flow (vph)	121	298	0	102	279	0	39	604	0	54	501	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	5.2	18.8		4.5	18.1		1.4	13.9		2.8	15.3	
Effective Green, g (s)	5.2	18.8		4.5	18.1		1.4	13.9		2.8	15.3	
Actuated g/C Ratio	0.09	0.34		0.08	0.32		0.02	0.25		0.05	0.27	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	151	549		131	541		41	792		82	882	
v/s Ratio Prot	c0.07	c0.18		0.06	0.17		0.02	c0.19		0.03	c0.16	
v/s Ratio Perm												
v/c Ratio	0.80	0.54		0.78	0.52		0.95	0.76		0.66	0.57	
Uniform Delay, d1	24.9	15.1		25.3	15.4		27.3	19.5		26.1	17.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	25.4	3.8		24.7	3.5		121.0	4.4		17.5	0.8	
Delay (s)	50.3	18.9		50.0	18.9		148.2	23.9		43.6	18.4	
Level of Service	D	B		D	B		F	C		D	B	
Approach Delay (s)		27.5			27.0			31.2			20.8	
Approach LOS		C			C			C			C	

Intersection Summary				
HCM Average Control Delay	26.7	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.58			
Actuated Cycle Length (s)	56.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	59.2%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Talmage Road & State Street

6/21/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	310	217	405	215	235	389
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.95			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3090			3200
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3090			3200
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	326	228	426	226	247	409
RTOR Reduction (vph)	0	167	128	0	0	0
Lane Group Flow (vph)	326	61	524	0	0	656
Turn Type		Perm			Split	
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	14.1	14.1	13.0			11.2
Effective Green, g (s)	14.1	14.1	13.0			11.2
Actuated g/C Ratio	0.27	0.27	0.25			0.21
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	439	393	768			685
v/s Ratio Prot	c0.20		c0.17			c0.21
v/s Ratio Perm		0.04				
v/c Ratio	0.74	0.16	0.68			0.96
Uniform Delay, d1	17.4	14.6	17.8			20.3
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	6.7	0.2	2.0			24.0
Delay (s)	24.1	14.8	19.8			44.3
Level of Service	C	B	B			D
Approach Delay (s)	20.3		19.8			44.3
Approach LOS	C		B			D

Intersection Summary				
HCM Average Control Delay	28.6	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	52.3	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	69.0%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Washington Avenue & State Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	181	207	50	50	54	83	34	615	131	131	532	160
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.98		1.00	0.91		1.00	0.97		1.00	0.97	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1655		1630	1560		1630	1670		1630	3147	
Flt Permitted		0.76		0.45	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1291		775	1560		1630	1670		1630	3147	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	191	218	53	53	57	87	36	647	138	138	560	168
RTOR Reduction (vph)	0	5	0	0	59	0	0	9	0	0	29	0
Lane Group Flow (vph)	0	457	0	53	85	0	36	776	0	138	699	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		30.0		30.0	30.0		3.6	42.6		7.0	46.0	
Effective Green, g (s)		30.0		30.0	30.0		3.6	42.6		7.0	46.0	
Actuated g/C Ratio		0.33		0.33	0.33		0.04	0.47		0.08	0.50	
Clearance Time (s)		4.0		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	3.0	
Lane Grp Cap (vph)		423		254	511		64	777		125	1580	
v/s Ratio Prot					0.05		0.02	c0.46		c0.08	c0.22	
v/s Ratio Perm		c0.35		0.07								
v/c Ratio		1.08		0.21	0.17		0.56	1.00		1.10	0.44	
Uniform Delay, d1		30.8		22.2	21.9		43.2	24.5		42.3	14.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		66.7		0.4	0.2		10.8	32.1		111.2	0.9	
Delay (s)		97.5		22.6	22.1		54.1	56.6		153.5	15.5	
Level of Service		F		C	C		D	E		F	B	
Approach Delay (s)		97.5			22.2			56.5			37.5	
Approach LOS		F			C			E			D	

Intersection Summary				
HCM Average Control Delay	54.7	HCM Level of Service	D	
HCM Volume to Capacity ratio	1.07			
Actuated Cycle Length (s)	91.6	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	99.6%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	46	395	0	0	519	54	0	0	0	25	0	45
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	48	416	0	0	546	57	0	0	0	26	0	47
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.91						0.91	0.91		0.91	0.91	0.91
vC, conflicting volume	603			416			1106	1116	208	851	1059	546
vC1, stage 1 conf vol							513	513		546	546	
vC2, stage 2 conf vol							594	603		305	513	
vCu, unblocked vol	512			416			1066	1077	208	785	1014	450
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			100	100	100	94	100	91
cM capacity (veh/h)	966			1140			319	365	798	447	400	511

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	48	208	208	546	57	74
Volume Left	48	0	0	0	0	26
Volume Right	0	0	0	0	57	47
cSH	966	1700	1700	1700	1700	486
Volume to Capacity	0.05	0.12	0.12	0.32	0.03	0.15
Queue Length 95th (ft)	4	0	0	0	0	13
Control Delay (s)	8.9	0.0	0.0	0.0	0.0	13.7
Lane LOS	A					B
Approach Delay (s)	0.9			0.0		13.7
Approach LOS						B

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	47.5%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Talmage Road & Airport Park Boulevard

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	250	132	418	476	15	124	0	237	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00		1.00		0.85	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)	1630	3091		1630	3245		3162		1458	1630	1623	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3091		1630	3245		3162		1458	1630	1623	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	263	139	440	501	16	131	0	249	9	32	18
RTOR Reduction (vph)	0	59	0	0	1	0	0	0	137	0	17	0
Lane Group Flow (vph)	8	343	0	440	516	0	131	0	112	9	33	0
Turn Type	Prot			Prot			custom		custom	Split		
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	0.7	27.6		24.2	51.1		7.5		35.7	4.1	4.1	
Effective Green, g (s)	0.7	27.6		24.2	51.1		7.5		35.7	4.1	4.1	
Actuated g/C Ratio	0.01	0.35		0.30	0.64		0.09		0.45	0.05	0.05	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	14	1074		497	2088		299		656	84	84	
v/s Ratio Prot	0.00	c0.11		c0.27	0.16		c0.04		0.08	0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.57	0.32		0.89	0.25		0.44		0.17	0.11	0.39	
Uniform Delay, d1	39.2	19.0		26.3	6.0		34.0		13.0	35.9	36.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	30.5	0.8		16.6	0.3		0.4		0.0	0.2	1.1	
Delay (s)	69.7	19.8		42.9	6.3		34.3		13.1	36.1	37.5	
Level of Service	E	B		D	A		C		B	D	D	
Approach Delay (s)		20.8			23.1			20.4			37.3	
Approach LOS		C			C			C			D	

Intersection Summary				
HCM Average Control Delay	22.5	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.55			
Actuated Cycle Length (s)	79.4	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	57.7%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
7: Talmage Road & U.S. 101 SB Ramps

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	458	0	0	419	0	0	0	137	0	0	527
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	482	0	0	441	0	0	0	144	0	0	555
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.92			0.92	0.92	0.92	0.92	0.92	
vC, conflicting volume	441			482			1478	923	482	1067	923	441
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	441			397			1476	875	397	1031	875	441
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	76	100	100	10
cM capacity (veh/h)	1119			1072			10	266	602	148	266	616

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	482	441	144	555
Volume Left	0	0	0	0
Volume Right	0	0	144	555
cSH	1700	1700	602	616
Volume to Capacity	0.28	0.26	0.24	0.90
Queue Length 95th (ft)	0	0	23	277
Control Delay (s)	0.0	0.0	12.9	42.0
Lane LOS			B	E
Approach Delay (s)	0.0	0.0	12.9	42.0
Approach LOS			B	E

Intersection Summary				
Average Delay	15.5			
Intersection Capacity Utilization	66.0%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: Talmage Road & U.S. 101 NB Ramps

6/21/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	268	0	0	311	104	35
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	282	0	0	327	109	37
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			282		609	282
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			282		609	282
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		76	95
cM capacity (veh/h)			1280		458	757

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	282	327	146
Volume Left	0	0	109
Volume Right	0	0	37
cSH	1700	1700	612
Volume to Capacity	0.17	0.19	0.24
Queue Length 95th (ft)	0	0	23
Control Delay (s)	0.0	0.0	14.0
Lane LOS			B
Approach Delay (s)	0.0	0.0	14.0
Approach LOS			B

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	36.7%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
9: Talmage Road & Hastings Frontage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	22	288	9	2	436	20	19	2	6	25	3	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	23	303	9	2	459	21	20	2	6	26	3	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	480			313			857	838	308	835	833	469
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	480			313			857	838	308	835	833	469
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			92	99	99	91	99	95
cM capacity (veh/h)	1082			1248			258	295	732	278	298	594

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	336	482	28	57
Volume Left	23	2	20	26
Volume Right	9	21	6	27
cSH	1082	1248	305	376
Volume to Capacity	0.02	0.00	0.09	0.15
Queue Length 95th (ft)	2	0	8	13
Control Delay (s)	0.8	0.1	18.0	16.3
Lane LOS	A	A	C	C
Approach Delay (s)	0.8	0.1	18.0	16.3
Approach LOS			C	C

Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	44.8%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
10: Commerce Drive & Airport Park Boulevard

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	54	146	2	21	27	59	179	6	34	359	114
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.93			0.93		1.00	1.00		1.00	0.96	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1570			1588		1630	3245		1630	3142	
Flt Permitted		0.90			0.98		0.47	1.00		0.63	1.00	
Satd. Flow (perm)		1439			1565		806	3245		1080	3142	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	57	154	2	22	28	62	188	6	36	378	120
RTOR Reduction (vph)	0	91	0	0	19	0	0	4	0	0	50	0
Lane Group Flow (vph)	0	194	0	0	33	0	62	190	0	36	448	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		9.0			9.0		11.9	11.9		11.9	11.9	
Effective Green, g (s)		9.0			9.0		11.9	11.9		11.9	11.9	
Actuated g/C Ratio		0.31			0.31		0.41	0.41		0.41	0.41	
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)		448			487		332	1336		445	1294	
v/s Ratio Prot								0.06			c0.14	
v/s Ratio Perm		c0.13			0.02		0.08			0.03		
v/c Ratio		0.43			0.07		0.19	0.14		0.08	0.35	
Uniform Delay, d1		7.9			7.0		5.4	5.3		5.2	5.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			0.1		0.3	0.0		0.1	0.2	
Delay (s)		8.6			7.1		5.7	5.4		5.3	6.0	
Level of Service		A			A		A	A		A	A	
Approach Delay (s)		8.6			7.1			5.4			5.9	
Approach LOS		A			A			A			A	

Intersection Summary					
HCM Average Control Delay	6.6	HCM Level of Service		A	
HCM Volume to Capacity ratio	0.38				
Actuated Cycle Length (s)	28.9	Sum of lost time (s)		8.0	
Intersection Capacity Utilization	52.0%	ICU Level of Service		A	
Analysis Period (min)	15				
c Critical Lane Group					

HCM Signalized Intersection Capacity Analysis
1: Mill Street & State Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	69	66	11	70	7	45	910	10	8	810	47
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.95			0.99			1.00			0.99	
Flt Protected		0.99			0.99			1.00			1.00	
Satd. Flow (prot)		1613			1687			3247			3232	
Flt Permitted		0.90			0.96			0.88			0.95	
Satd. Flow (perm)		1474			1633			2872			3056	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	61	73	69	12	74	7	47	958	11	8	853	49
RTOR Reduction (vph)	0	38	0	0	4	0	0	2	0	0	10	0
Lane Group Flow (vph)	0	165	0	0	89	0	0	1014	0	0	900	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			16.0			16.0	
Effective Green, g (s)		16.0			16.0			16.0			16.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		590			653			1149			1222	
v/s Ratio Prot												
v/s Ratio Perm		c0.11			0.05			c0.35			0.29	
v/c Ratio		0.28			0.14			0.88			0.74	
Uniform Delay, d1		8.1			7.6			11.1			10.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			0.4			9.9			4.0	
Delay (s)		9.3			8.0			21.1			14.2	
Level of Service		A			A			C			B	
Approach Delay (s)		9.3			8.0			21.1			14.2	
Approach LOS		A			A			C			B	

Intersection Summary				
HCM Average Control Delay	16.6	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.58			
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	83.7%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Gobbi Street & State Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	112	232	92	202	214	60	161	781	139	108	774	60
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	0.95		1.00	0.95	
Frt	1.00	0.96		1.00	0.97		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)	1630	1642		1630	1659		1630	3186		1630	3225	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1642		1630	1659		1630	3186		1630	3225	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	118	244	97	213	225	63	169	822	146	114	815	63
RTOR Reduction (vph)	0	13	0	0	9	0	0	14	0	0	5	0
Lane Group Flow (vph)	118	328	0	213	279	0	169	954	0	114	873	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.5	29.1		16.6	33.2		13.3	33.9		9.8	30.4	
Effective Green, g (s)	12.5	29.1		16.6	33.2		13.3	33.9		9.8	30.4	
Actuated g/C Ratio	0.12	0.28		0.16	0.31		0.13	0.32		0.09	0.29	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	193	453		257	523		206	1025		152	930	
v/s Ratio Prot	0.07	c0.20		c0.13	0.17		0.10	c0.30		0.07	c0.27	
v/s Ratio Perm												
v/c Ratio	0.61	0.72		0.83	0.53		0.82	0.93		0.75	0.94	
Uniform Delay, d1	44.1	34.5		43.0	29.7		44.9	34.6		46.6	36.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.6	9.7		19.3	3.9		22.3	14.4		18.6	16.5	
Delay (s)	49.8	44.2		62.3	33.6		67.2	49.0		65.2	53.1	
Level of Service	D	D		E	C		E	D		E	D	
Approach Delay (s)		45.6			45.8			51.7			54.5	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM Average Control Delay	50.7	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.83			
Actuated Cycle Length (s)	105.4	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	79.8%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Talmage Road & State Street

6/21/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	319	348	563	266	359	517
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.95			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1630	1458	3103			3194
Flt Permitted	0.95	1.00	1.00			0.98
Satd. Flow (perm)	1630	1458	3103			3194
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	336	366	593	280	378	544
RTOR Reduction (vph)	0	279	81	0	0	0
Lane Group Flow (vph)	336	87	792	0	0	922
Turn Type		Perm			Split	
Protected Phases	4		2		1	1
Permitted Phases		4				
Actuated Green, G (s)	16.2	16.2	19.1			19.0
Effective Green, g (s)	16.2	16.2	19.1			19.0
Actuated g/C Ratio	0.24	0.24	0.28			0.28
Clearance Time (s)	4.0	4.0	5.0			5.0
Vehicle Extension (s)	3.0	3.0	2.0			2.0
Lane Grp Cap (vph)	387	346	868			889
v/s Ratio Prot	c0.21		c0.26			c0.29
v/s Ratio Perm		0.06				
v/c Ratio	0.87	0.25	0.91			1.04
Uniform Delay, d1	25.0	21.1	23.8			24.6
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	18.2	0.4	13.4			40.2
Delay (s)	43.2	21.5	37.2			64.9
Level of Service	D	C	D			E
Approach Delay (s)	31.9		37.2			64.9
Approach LOS	C		D			E

Intersection Summary				
HCM Average Control Delay	45.9	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.94			
Actuated Cycle Length (s)	68.3	Sum of lost time (s)	14.0	
Intersection Capacity Utilization	83.8%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Washington Avenue & State Street

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	159	86	31	148	65	125	37	612	140	150	589	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.98		1.00	0.90		1.00	0.97		1.00	0.97	
Flt Protected		0.97		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1642		1630	1546		1630	1668		1630	3166	
Flt Permitted		0.57		0.58	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		968		993	1546		1630	1668		1630	3166	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	167	91	33	156	68	132	39	644	147	158	620	147
RTOR Reduction (vph)	0	4	0	0	70	0	0	8	0	0	19	0
Lane Group Flow (vph)	0	287	0	156	130	0	39	783	0	158	748	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		27.0		27.0	27.0		4.2	57.6		5.0	58.4	
Effective Green, g (s)		27.0		27.0	27.0		4.2	57.6		5.0	58.4	
Actuated g/C Ratio		0.27		0.27	0.27		0.04	0.57		0.05	0.57	
Clearance Time (s)		4.0		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	3.0	
Lane Grp Cap (vph)		257		264	411		67	946		80	1820	
v/s Ratio Prot					0.08		0.02	c0.47		c0.10	0.24	
v/s Ratio Perm		c0.30		0.16								
v/c Ratio		1.12		0.59	0.32		0.58	0.83		1.98	0.41	
Uniform Delay, d1		37.3		32.5	29.9		47.8	17.9		48.3	12.0	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		90.6		3.5	0.4		12.2	8.2		480.4	0.7	
Delay (s)		127.9		36.0	30.3		60.1	26.2		528.7	12.7	
Level of Service		F		D	C		E	C		F	B	
Approach Delay (s)		127.9			32.8			27.8			100.8	
Approach LOS		F			C			C			F	

Intersection Summary				
HCM Average Control Delay	68.8	HCM Level of Service	E	
HCM Volume to Capacity ratio	0.98			
Actuated Cycle Length (s)	101.6	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	95.1%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
5: Talmage Road & Waugh Lane

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	88	770	0	0	791	87	0	0	0	77	0	82
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	93	811	0	0	833	92	0	0	0	81	0	86
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)					505							
pX, platoon unblocked	0.89						0.89	0.89		0.89	0.89	0.89
vC, conflicting volume	924			811			1915	1920	405	1423	1828	833
vC1, stage 1 conf vol							996	996		833	833	
vC2, stage 2 conf vol							919	924		591	996	
vCu, unblocked vol	855			811			1965	1971	405	1414	1868	752
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			100	100	100	69	100	73
cM capacity (veh/h)	708			811			102	183	595	262	223	319

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	93	405	405	833	92	167
Volume Left	93	0	0	0	0	81
Volume Right	0	0	0	0	92	86
cSH	708	1700	1700	1700	1700	289
Volume to Capacity	0.13	0.24	0.24	0.49	0.05	0.58
Queue Length 95th (ft)	11	0	0	0	0	85
Control Delay (s)	10.8	0.0	0.0	0.0	0.0	33.4
Lane LOS	B					D
Approach Delay (s)	1.1			0.0		33.4
Approach LOS						D

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	70.6%	ICU Level of Service		C
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Talmage Road & Airport Park Boulevard

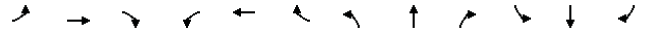
6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	381	386	614	447	14	372	0	814	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.92		1.00	1.00		1.00		0.85	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)	1630	3014		1630	3245		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3014		1630	3245		3162		1458	1630	1629	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	401	406	646	471	15	392	0	857	14	49	25
RTOR Reduction (vph)	0	168	0	0	2	0	0	0	245	0	20	0
Lane Group Flow (vph)	15	639	0	646	484	0	392	0	612	14	54	0
Turn Type	Prot			Prot			custom		custom	Split		
Protected Phases	5	2		1	6		8		1 8	7	7	
Permitted Phases							8					
Actuated Green, G (s)	0.8	27.4		24.1	50.7		17.9		46.0	6.4	6.4	
Effective Green, g (s)	0.8	27.4		24.1	50.7		17.9		46.0	6.4	6.4	
Actuated g/C Ratio	0.01	0.30		0.26	0.55		0.19		0.50	0.07	0.07	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0			2.0	2.0	
Lane Grp Cap (vph)	14	900		428	1792		617		731	114	114	
v/s Ratio Prot	0.01	c0.21		c0.40	0.15		0.12		c0.42	0.01	c0.03	
v/s Ratio Perm												
v/c Ratio	1.07	0.71		1.51	0.27		0.64		0.84	0.12	0.47	
Uniform Delay, d1	45.5	28.7		33.8	10.8		34.0		19.7	40.1	41.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00		1.00	1.00	1.00	
Incremental Delay, d2	265.6	4.7		241.1	0.4		1.6		7.9	0.2	1.1	
Delay (s)	311.1	33.4		274.9	11.2		35.5		27.6	40.2	42.2	
Level of Service	F	C		F	B		D		C	D	D	
Approach Delay (s)		38.4			161.7			30.1			41.9	
Approach LOS		D			F			C			D	

Intersection Summary				
HCM Average Control Delay	77.7	HCM Level of Service		E
HCM Volume to Capacity ratio	0.95			
Actuated Cycle Length (s)	91.8	Sum of lost time (s)		12.0
Intersection Capacity Utilization	93.0%	ICU Level of Service		F
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
7: Talmage Road & U.S. 101 SB Ramps

6/21/2012



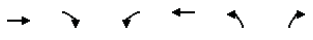
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑				↱			↱
Volume (veh/h)	0	1071	0	0	446	0	0	0	196	0	0	686
Sign Control		Free			Free			Yield			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	1127	0	0	469	0	0	0	206	0	0	722
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		571										
pX, platoon unblocked				0.80			0.80	0.80	0.80	0.80	0.80	
vC, conflicting volume	469			1127			2319	1597	1127	1803	1597	469
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	469			1033			2527	1621	1033	1880	1621	469
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			0	100	8	100	100	0
cM capacity (veh/h)	1092			536			0	82	225	4	82	594

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1127	469	206	722
Volume Left	0	0	0	0
Volume Right	0	0	206	722
cSH	1700	1700	225	594
Volume to Capacity	0.66	0.28	0.92	1.22
Queue Length 95th (ft)	0	0	192	658
Control Delay (s)	0.0	0.0	85.5	135.0
Lane LOS			F	F
Approach Delay (s)	0.0	0.0	85.5	135.0
Approach LOS			F	F

Intersection Summary				
Average Delay	45.6			
Intersection Capacity Utilization	81.0%	ICU Level of Service	D	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
8: Talmage Road & U.S. 101 NB Ramps

6/21/2012



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↰	↱
Volume (veh/h)	500	0	0	300	143	45
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	526	0	0	316	151	47
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			526		842	526
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			526		842	526
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		55	91
cM capacity (veh/h)			1041		334	552

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	526	316	198
Volume Left	0	0	151
Volume Right	0	0	47
cSH	1700	1700	404
Volume to Capacity	0.31	0.19	0.49
Queue Length 95th (ft)	0	0	65
Control Delay (s)	0.0	0.0	22.1
Lane LOS			C
Approach Delay (s)	0.0	0.0	22.1
Approach LOS			C

Intersection Summary				
Average Delay	4.2			
Intersection Capacity Utilization	83.9%	ICU Level of Service	E	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road/Talmage Road

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	248	101	262	475	15	115	0	212	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00		1.00		0.85	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)	1630	3118		3162	3245		3162		1458	1630	1625	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3118		3162	3245		3162		1458	1630	1625	
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)	9	270	110	285	516	16	125	0	230	10	33	18
RTOR Reduction (vph)	0	28	0	0	1	0	0	0	210	0	17	0
Lane Group Flow (vph)	9	352	0	285	531	0	125	0	20	10	34	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8			7	7	
Permitted Phases							8		8			
Actuated Green, G (s)	1.3	56.0		13.3	68.0		8.9		8.9	5.8	5.8	
Effective Green, g (s)	1.3	56.0		13.3	68.0		8.9		8.9	5.8	5.8	
Actuated g/C Ratio	0.01	0.56		0.13	0.68		0.09		0.09	0.06	0.06	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	21	1746		421	2207		281		130	95	94	
v/s Ratio Prot	0.01	0.11		c0.09	c0.16		c0.04			0.01	c0.02	
v/s Ratio Perm									0.01			
v/c Ratio	0.43	0.20		0.68	0.24		0.44		0.16	0.11	0.36	
Uniform Delay, d1	49.0	10.9		41.3	6.1		43.2		42.1	44.6	45.3	
Progression Factor	1.00	1.00		0.81	0.78		1.00		1.00	1.00	1.00	
Incremental Delay, d2	5.0	0.3		3.2	0.2		0.4		0.2	0.2	0.9	
Delay (s)	54.0	11.2		36.4	5.0		43.6		42.3	44.8	46.2	
Level of Service	D	B		D	A		D		D	D	D	
Approach Delay (s)		12.2			16.0			42.8			46.0	
Approach LOS		B			B			D			D	

Intersection Summary				
HCM Average Control Delay	22.1	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.33			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	39.3%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
77: US 101 SB Ramps (realigned) & Talmage Road

6/22/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	429	65	41	329	426	141
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	*0.65		1.00	1.00	0.97	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	2186		1630	1716	3162	1458
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	2186		1630	1716	3162	1458
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	466	71	45	358	463	153
RTOR Reduction (vph)	6	0	0	0	0	110
Lane Group Flow (vph)	531	0	45	358	463	43
Turn Type	NA		Prot	NA	NA	pm+ov
Protected Phases	2		1	6	8	1
Permitted Phases						8
Actuated Green, G (s)	59.6		8.2	71.8	20.2	28.4
Effective Green, g (s)	59.6		8.2	71.8	20.2	28.4
Actuated g/C Ratio	0.60		0.08	0.72	0.20	0.28
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1303		134	1232	639	472
v/s Ratio Prot	c0.24		0.03	c0.21	c0.15	0.01
v/s Ratio Perm						0.02
v/c Ratio	0.41		0.34	0.29	0.72	0.09
Uniform Delay, d1	10.8		43.3	5.0	37.3	26.3
Progression Factor	0.86		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9		1.5	0.6	4.1	0.1
Delay (s)	10.2		44.8	5.6	41.4	26.4
Level of Service	B		D	A	D	C
Approach Delay (s)	10.2			10.0	37.7	
Approach LOS	B			A	D	

Intersection Summary				
HCM Average Control Delay	21.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	41.7%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road/Talmage Road

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	410	259	398	486	14	223	0	491	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00		0.85	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)	1630	3070		3162	3246		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3070		3162	3246		3162		1458	1630	1629	
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)	15	446	282	433	528	15	242	0	534	14	51	26
RTOR Reduction (vph)	0	77	0	0	2	0	0	0	460	0	20	0
Lane Group Flow (vph)	15	651	0	433	541	0	242	0	74	14	57	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8			7	7	
Permitted Phases							8		8			
Actuated Green, G (s)	2.0	45.9		17.2	61.1		13.8		13.8	7.1	7.1	
Effective Green, g (s)	2.0	45.9		17.2	61.1		13.8		13.8	7.1	7.1	
Actuated g/C Ratio	0.02	0.46		0.17	0.61		0.14		0.14	0.07	0.07	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	33	1409		544	1983		436		201	116	116	
v/s Ratio Prot	0.01	c0.21		c0.14	0.17		c0.08			0.01	c0.03	
v/s Ratio Perm									0.05			
v/c Ratio	0.45	0.46		0.80	0.27		0.56		0.37	0.12	0.49	
Uniform Delay, d1	48.5	18.6		39.7	9.1		40.2		39.1	43.5	44.7	
Progression Factor	1.00	1.00		0.72	1.28		1.00		1.00	1.00	1.00	
Incremental Delay, d2	3.6	1.1		6.1	0.3		0.9		0.4	0.2	1.2	
Delay (s)	52.0	19.7		34.6	11.9		41.1		39.5	43.7	45.9	
Level of Service	D	B		C	B		D		D	D	D	
Approach Delay (s)		20.3			22.0			40.0			45.5	
Approach LOS		C			C			D			D	

Intersection Summary				
HCM Average Control Delay	27.7	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.55			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	67.7%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
77: US 101 SB Ramps (realigned) & Talmage Road

6/22/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	872	93	27	382	555	186
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	*0.65		1.00	1.00	0.97	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	2198		1630	1716	3162	1458
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	2198		1630	1716	3162	1458
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	948	101	29	415	603	202
RTOR Reduction (vph)	5	0	0	0	0	90
Lane Group Flow (vph)	1044	0	29	415	603	112
Turn Type	NA		Prot	NA	NA	pm+ov
Protected Phases	2		1	6	8	1
Permitted Phases						8
Actuated Green, G (s)	59.5		5.4	68.9	23.1	28.5
Effective Green, g (s)	59.5		5.4	68.9	23.1	28.5
Actuated g/C Ratio	0.60		0.05	0.69	0.23	0.28
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1308		88	1182	730	474
v/s Ratio Prot	c0.48		0.02	c0.24	c0.19	0.01
v/s Ratio Perm						0.06
v/c Ratio	0.80		0.33	0.35	0.83	0.24
Uniform Delay, d1	15.6		45.6	6.4	36.5	27.4
Progression Factor	0.66		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.2		2.2	0.8	7.6	0.3
Delay (s)	14.6		47.8	7.2	44.1	27.7
Level of Service	B		D	A	D	C
Approach Delay (s)	14.6			9.8	40.0	
Approach LOS	B			A	D	

Intersection Summary				
HCM Average Control Delay	22.6	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	53.2%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: State Street & Washington Avenue/Hastings Avenue

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	181	205	50	47	53	66	34	615	126	103	532	160
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.98		1.00	0.92		1.00	0.97		1.00	0.97	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1655		1630	1574		1630	1672		1630	3147	
Flt Permitted		0.79		0.46	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1342		782	1574		1630	1672		1630	3147	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	191	216	53	49	56	69	36	647	133	108	560	168
RTOR Reduction (vph)	0	5	0	0	46	0	0	8	0	0	29	0
Lane Group Flow (vph)	0	455	0	49	79	0	36	772	0	108	699	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		31.0		31.0	31.0		3.6	43.6		5.0	45.0	
Effective Green, g (s)		31.0		31.0	31.0		3.6	43.6		5.0	45.0	
Actuated g/C Ratio		0.34		0.34	0.34		0.04	0.48		0.05	0.49	
Clearance Time (s)		4.0		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	3.0	
Lane Grp Cap (vph)		454		265	533		64	796		89	1546	
v/s Ratio Prot					0.05		0.02	c0.46		c0.07	0.22	
v/s Ratio Perm		c0.34		0.06								
v/c Ratio		1.00		0.18	0.15		0.56	0.97		1.21	0.45	
Uniform Delay, d1		30.3		21.4	21.1		43.2	23.4		43.3	15.2	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		42.6		0.3	0.1		10.8	25.4		163.6	1.0	
Delay (s)		72.9		21.7	21.2		54.1	48.8		206.9	16.2	
Level of Service		E		C	C		D	D		F	B	
Approach Delay (s)		72.9			21.4			49.0			40.8	
Approach LOS		E			C			D			D	

Intersection Summary				
HCM Average Control Delay	48.7	HCM Level of Service	D	
HCM Volume to Capacity ratio	1.00			
Actuated Cycle Length (s)	91.6	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	92.2%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	259	112	355	494	15	106	0	206	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00		1.00		0.85	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)	1630	3112		3162	3245		3162		1458	1630	1623	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3112		3162	3245		3162		1458	1630	1623	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	273	118	374	520	16	112	0	217	9	32	18
RTOR Reduction (vph)	0	35	0	0	2	0	0	0	193	0	16	0
Lane Group Flow (vph)	8	356	0	374	535	0	112	0	24	9	34	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8			7	7	
Permitted Phases							8		8			
Actuated Green, G (s)	0.8	47.2		16.1	62.5		11.2		11.2	9.5	9.5	
Effective Green, g (s)	0.8	47.2		16.1	62.5		11.2		11.2	9.5	9.5	
Actuated g/C Ratio	0.01	0.47		0.16	0.62		0.11		0.11	0.10	0.10	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	13	1469		509	2028		354		163	155	154	
v/s Ratio Prot	0.00	0.11		c0.12	c0.16		c0.04			0.01	c0.02	
v/s Ratio Perm									0.02			
v/c Ratio	0.62	0.24		0.73	0.26		0.32		0.15	0.06	0.22	
Uniform Delay, d1	49.4	15.7		39.9	8.4		40.9		40.1	41.2	41.8	
Progression Factor	1.00	1.00		0.99	0.88		1.00		1.00	1.00	1.00	
Incremental Delay, d2	48.2	0.4		4.1	0.3		0.2		0.2	0.1	0.3	
Delay (s)	97.6	16.1		43.7	7.7		41.1		40.3	41.2	42.1	
Level of Service	F	B		D	A		D		D	D	D	
Approach Delay (s)		17.8			22.5			40.5			42.0	
Approach LOS		B			C			D			D	

Intersection Summary				
HCM Average Control Delay	25.5	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.35			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	42.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
77: US 101 SB Ramps (realigned) & Talmage Road 6/22/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	469	62	45	459	496	137
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	*0.65		1.00	1.00	0.97	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	2191		1630	1716	3162	1458
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	2191		1630	1716	3162	1458
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	494	65	47	483	522	144
RTOR Reduction (vph)	12	0	0	0	0	94
Lane Group Flow (vph)	547	0	47	483	522	50
Turn Type	NA		Prot	NA	NA	pm+ov
Protected Phases	2		1	6	8	1
Permitted Phases						8
Actuated Green, G (s)	20.6		4.0	28.6	13.4	17.4
Effective Green, g (s)	20.6		4.0	28.6	13.4	17.4
Actuated g/C Ratio	0.41		0.08	0.57	0.27	0.35
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	903		130	982	847	624
v/s Ratio Prot	c0.25		0.03	c0.28	c0.17	0.01
v/s Ratio Perm						0.03
v/c Ratio	0.61		0.36	0.49	0.62	0.08
Uniform Delay, d1	11.5		21.8	6.4	16.0	10.9
Progression Factor	1.43		1.00	1.00	1.00	1.00
Incremental Delay, d2	2.9		1.7	1.8	1.3	0.1
Delay (s)	19.3		23.5	8.1	17.4	11.0
Level of Service	B		C	A	B	B
Approach Delay (s)	19.3			9.5	16.0	
Approach LOS	B			A	B	

Intersection Summary				
HCM Average Control Delay	15.1	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.62			
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	48.3%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: State Street & Washington Avenue/Hastings Avenue

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	159	79	31	130	58	14	37	612	123	43	589	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		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	0.95	
Frt		0.98		1.00	0.97		1.00	0.97		1.00	0.97	
Flt Protected		0.97		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1640		1630	1665		1630	1673		1630	3166	
Flt Permitted		0.78		0.59	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1309		1011	1665		1630	1673		1630	3166	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	167	83	33	137	61	15	39	644	129	45	620	147
RTOR Reduction (vph)	0	5	0	0	9	0	0	7	0	0	18	0
Lane Group Flow (vph)	0	278	0	137	67	0	39	766	0	45	749	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		23.5		23.5	23.5		4.0	57.5		3.9	57.4	
Effective Green, g (s)		23.5		23.5	23.5		4.0	57.5		3.9	57.4	
Actuated g/C Ratio		0.24		0.24	0.24		0.04	0.59		0.04	0.59	
Clearance Time (s)		4.0		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	3.0	
Lane Grp Cap (vph)		317		245	404		67	993		66	1875	
v/s Ratio Prot					0.04		0.02	c0.46		c0.03	0.24	
v/s Ratio Perm		c0.21		0.14								
v/c Ratio		0.88		0.56	0.17		0.58	0.77		0.68	0.40	
Uniform Delay, d1		35.3		32.2	29.0		45.6	14.8		45.9	10.5	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		22.6		2.8	0.2		12.2	5.8		25.2	0.6	
Delay (s)		57.9		34.9	29.2		57.9	20.6		71.1	11.2	
Level of Service		E		C	C		E	C		E	B	
Approach Delay (s)		57.9			32.9			22.4			14.5	
Approach LOS		E			C			C			B	

Intersection Summary				
HCM Average Control Delay	25.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	96.9	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	72.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	417	309	397	491	14	283	0	597	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00		0.85	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)	1630	3052		3162	3246		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3052		3162	3246		3162		1458	1630	1629	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	439	325	418	517	15	298	0	628	14	49	25
RTOR Reduction (vph)	0	109	0	0	2	0	0	0	536	0	21	0
Lane Group Flow (vph)	15	655	0	418	530	0	298	0	92	14	53	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8			7	7	
Permitted Phases							8		8			
Actuated Green, G (s)	1.6	40.9		16.8	56.1		14.4		14.4	9.9	9.9	
Effective Green, g (s)	1.6	40.9		16.8	56.1		14.4		14.4	9.9	9.9	
Actuated g/C Ratio	0.02	0.42		0.17	0.57		0.15		0.15	0.10	0.10	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	27	1274		542	1858		465		214	165	165	
v/s Ratio Prot	0.01	c0.21		c0.13	0.16		c0.09			0.01	c0.03	
v/s Ratio Perm									0.06			
v/c Ratio	0.56	0.51		0.77	0.29		0.64		0.43	0.08	0.32	
Uniform Delay, d1	47.8	21.2		38.8	10.7		39.4		38.1	39.9	40.9	
Progression Factor	1.00	1.00		0.73	1.28		1.00		1.00	1.00	1.00	
Incremental Delay, d2	13.3	1.5		4.9	0.3		2.3		0.5	0.1	0.4	
Delay (s)	61.1	22.7		33.1	14.0		41.6		38.6	40.0	41.4	
Level of Service	E	C		C	B		D		D	D	D	
Approach Delay (s)		23.4			22.4			39.6			41.1	
Approach LOS		C			C			D			D	

Intersection Summary				
HCM Average Control Delay	29.1	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	98.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	76.7%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	966	138	23	415	569	196
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	*0.65		1.00	1.00	0.97	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	2189		1630	1716	3162	1458
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	2189		1630	1716	3162	1458
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1017	145	24	437	599	206
RTOR Reduction (vph)	7	0	0	0	0	81
Lane Group Flow (vph)	1155	0	24	437	599	125
Turn Type	NA		Prot	NA	NA	pm+ov
Protected Phases	2		1	6	8	1
Permitted Phases						8
Actuated Green, G (s)	58.9		5.2	68.1	21.9	27.1
Effective Green, g (s)	58.9		5.2	68.1	21.9	27.1
Actuated g/C Ratio	0.60		0.05	0.69	0.22	0.28
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1316		86	1192	707	463
v/s Ratio Prot	c0.53		0.01	c0.25	c0.19	0.01
v/s Ratio Perm						0.07
v/c Ratio	0.88		0.28	0.37	0.85	0.27
Uniform Delay, d1	16.5		44.6	6.1	36.4	27.7
Progression Factor	0.67		1.00	1.00	1.00	1.00
Incremental Delay, d2	6.7		1.8	0.9	9.3	0.3
Delay (s)	17.8		46.4	7.0	45.7	28.0
Level of Service	B		D	A	D	C
Approach Delay (s)	17.8			9.0	41.2	
Approach LOS	B			A	D	

Intersection Summary				
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	98.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road/Talmage Road

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	236	120	306	454	15	132	0	231	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00		1.00		0.85	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)	1630	3096		3162	3244		3162		1458	1630	1625	
Flt Permitted	0.95	1.00		0.95	1.00		0.72		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3096		3162	3244		2409		1458	1630	1625	
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)	9	257	130	333	493	16	143	0	251	10	33	18
RTOR Reduction (vph)	0	42	0	0	1	0	0	0	225	0	17	0
Lane Group Flow (vph)	9	345	0	333	508	0	143	0	26	10	34	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6					7	7	
Permitted Phases							8		8			
Actuated Green, G (s)	1.3	53.0		14.8	66.5		10.4		10.4	5.8	5.8	
Effective Green, g (s)	1.3	53.0		14.8	66.5		10.4		10.4	5.8	5.8	
Actuated g/C Ratio	0.01	0.53		0.15	0.66		0.10		0.10	0.06	0.06	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	21	1641		468	2157		251		152	95	94	
v/s Ratio Prot	0.01	0.11		c0.11	c0.16					0.01	c0.02	
v/s Ratio Perm							c0.06		0.02			
v/c Ratio	0.43	0.21		0.71	0.24		0.57		0.17	0.11	0.36	
Uniform Delay, d1	49.0	12.4		40.6	6.7		42.7		40.9	44.6	45.3	
Progression Factor	1.00	1.00		0.80	0.72		1.00		1.00	1.00	1.00	
Incremental Delay, d2	5.0	0.3		3.9	0.2		1.8		0.2	0.2	0.9	
Delay (s)	54.0	12.7		36.5	5.0		44.4		41.1	44.8	46.2	
Level of Service	D	B		D	A		D		D	D	D	
Approach Delay (s)		13.7			17.5			42.3			46.0	
Approach LOS		B			B			D			D	

Intersection Summary				
HCM Average Control Delay	23.4	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.36			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	41.5%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
77: US 101 SB Ramps (realigned) & Talmage Road

6/22/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	437	67	38	333	444	137
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	*0.65		1.00	1.00	0.97	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	2186		1630	1716	3162	1458
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	2186		1630	1716	3162	1458
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	475	73	41	362	483	149
RTOR Reduction (vph)	6	0	0	0	0	105
Lane Group Flow (vph)	542	0	41	362	483	44
Turn Type	NA		Prot	NA	NA	pm+ov
Protected Phases	2		1	6	8	1
Permitted Phases						8
Actuated Green, G (s)	58.8		8.0	70.8	21.2	29.2
Effective Green, g (s)	58.8		8.0	70.8	21.2	29.2
Actuated g/C Ratio	0.59		0.08	0.71	0.21	0.29
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1285		130	1215	670	484
v/s Ratio Prot	c0.25		0.03	c0.21	c0.15	0.01
v/s Ratio Perm						0.02
v/c Ratio	0.42		0.32	0.30	0.72	0.09
Uniform Delay, d1	11.3		43.4	5.4	36.6	25.7
Progression Factor	0.91		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0		1.4	0.6	3.8	0.1
Delay (s)	11.2		44.8	6.0	40.5	25.8
Level of Service	B		D	A	D	C
Approach Delay (s)	11.2			10.0	37.0	
Approach LOS	B			A	D	

Intersection Summary				
HCM Average Control Delay	21.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.49			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	42.5%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road/Talmage Road

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	366	329	574	434	14	312	0	681	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00		1.00		0.85	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)	1630	3028		3162	3245		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3028		3162	3245		3162		1458	1630	1629	
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)	15	398	358	624	472	15	339	0	740	14	51	26
RTOR Reduction (vph)	0	140	0	0	2	0	0	0	547	0	20	0
Lane Group Flow (vph)	15	616	0	624	485	0	339	0	193	14	57	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8			7	7	
Permitted Phases							8		8			
Actuated Green, G (s)	1.6	35.7		22.2	56.3		19.0		19.0	7.1	7.1	
Effective Green, g (s)	1.6	35.7		22.2	56.3		19.0		19.0	7.1	7.1	
Actuated g/C Ratio	0.02	0.36		0.22	0.56		0.19		0.19	0.07	0.07	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	26	1081		702	1827		601		277	116	116	
v/s Ratio Prot	0.01	c0.20		c0.20	0.15		0.11			0.01	c0.03	
v/s Ratio Perm									c0.13			
v/c Ratio	0.58	0.57		0.89	0.27		0.56		0.70	0.12	0.49	
Uniform Delay, d1	48.9	26.0		37.7	11.2		36.7		37.8	43.5	44.7	
Progression Factor	1.00	1.00		0.69	1.28		1.00		1.00	1.00	1.00	
Incremental Delay, d2	17.8	2.2		9.6	0.3		0.7		6.1	0.2	1.2	
Delay (s)	66.6	28.1		35.8	14.6		37.5		43.9	43.7	45.9	
Level of Service	E	C		D	B		D		D	D	D	
Approach Delay (s)		28.9			26.5			41.9			45.5	
Approach LOS		C			C			D			D	

Intersection Summary				
HCM Average Control Delay	33.1	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	81.6%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
77: US 101 SB Ramps (realigned) & Talmage Road

6/22/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	983	118	18	407	644	177
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	*0.65		1.00	1.00	0.97	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	2195		1630	1716	3162	1458
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	2195		1630	1716	3162	1458
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1068	128	20	442	700	192
RTOR Reduction (vph)	6	0	0	0	0	70
Lane Group Flow (vph)	1190	0	20	442	700	122
Turn Type	NA		Prot	NA	NA	pm+ov
Protected Phases	2		1	6	8	1
Permitted Phases						8
Actuated Green, G (s)	59.2		4.3	67.5	24.5	28.8
Effective Green, g (s)	59.2		4.3	67.5	24.5	28.8
Actuated g/C Ratio	0.59		0.04	0.68	0.24	0.29
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1299		70	1158	775	478
v/s Ratio Prot	c0.54		0.01	c0.26	c0.22	0.01
v/s Ratio Perm						0.07
v/c Ratio	0.92		0.29	0.38	0.90	0.25
Uniform Delay, d1	18.2		46.4	7.1	36.6	27.3
Progression Factor	0.73		1.00	1.00	1.00	1.00
Incremental Delay, d2	8.1		2.2	1.0	13.8	0.3
Delay (s)	21.4		48.6	8.1	50.4	27.6
Level of Service	C		D	A	D	C
Approach Delay (s)	21.4			9.8	45.5	
Approach LOS	C			A	D	

Intersection Summary				
HCM Average Control Delay	27.7	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.89			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	60.2%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road/Talmage Road

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	239	121	325	457	15	133	0	243	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00		1.00		0.85	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)	1630	3095		3162	3245		3162		1458	1630	1625	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3095		3162	3245		3162		1458	1630	1625	
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)	9	260	132	353	497	16	145	0	264	10	33	18
RTOR Reduction (vph)	0	44	0	0	1	0	0	0	239	0	17	0
Lane Group Flow (vph)	9	348	0	353	512	0	145	0	25	10	34	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8			7	7	
Permitted Phases							8		8			
Actuated Green, G (s)	1.3	53.2		15.4	67.3		9.6		9.6	5.8	5.8	
Effective Green, g (s)	1.3	53.2		15.4	67.3		9.6		9.6	5.8	5.8	
Actuated g/C Ratio	0.01	0.53		0.15	0.67		0.10		0.10	0.06	0.06	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	21	1647		487	2184		304		140	95	94	
v/s Ratio Prot	0.01	0.11		c0.11	c0.16		c0.05			0.01	c0.02	
v/s Ratio Perm									0.02			
v/c Ratio	0.43	0.21		0.72	0.23		0.48		0.18	0.11	0.36	
Uniform Delay, d1	49.0	12.3		40.3	6.3		42.8		41.6	44.6	45.3	
Progression Factor	1.00	1.00		0.82	0.77		1.00		1.00	1.00	1.00	
Incremental Delay, d2	5.0	0.3		4.2	0.2		0.4		0.2	0.2	0.9	
Delay (s)	54.0	12.6		37.1	5.1		43.3		41.8	44.8	46.2	
Level of Service	D	B		D	A		D		D	D	D	
Approach Delay (s)		13.6			18.1			42.3			46.0	
Approach LOS		B			B			D			D	

Intersection Summary				
HCM Average Control Delay	23.8	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.35			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	42.2%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
77: US 101 SB Ramps (realigned) & Talmage Road

6/22/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	451	69	41	342	457	141
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	*0.65		1.00	1.00	0.97	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	2186		1630	1716	3162	1458
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	2186		1630	1716	3162	1458
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	490	75	45	372	497	153
RTOR Reduction (vph)	6	0	0	0	0	107
Lane Group Flow (vph)	559	0	45	372	497	46
Turn Type	NA		Prot	NA	NA	pm+ov
Protected Phases	2		1	6	8	1
Permitted Phases						8
Actuated Green, G (s)	58.2		8.2	70.4	21.6	29.8
Effective Green, g (s)	58.2		8.2	70.4	21.6	29.8
Actuated g/C Ratio	0.58		0.08	0.70	0.22	0.30
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1272		134	1208	683	493
v/s Ratio Prot	c0.26		0.03	c0.22	c0.16	0.01
v/s Ratio Perm						0.02
v/c Ratio	0.44		0.34	0.31	0.73	0.09
Uniform Delay, d1	11.7		43.3	5.6	36.5	25.3
Progression Factor	0.88		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0		1.5	0.7	3.9	0.1
Delay (s)	11.4		44.8	6.3	40.3	25.4
Level of Service	B		D	A	D	C
Approach Delay (s)	11.4			10.4	36.8	
Approach LOS	B			B	D	

Intersection Summary				
HCM Average Control Delay	21.3	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.50			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	43.4%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road/Talmage Road

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	374	336	613	442	14	312	0	708	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.93		1.00	1.00		1.00		0.85	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)	1630	3029		3162	3245		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3029		3162	3245		3162		1458	1630	1629	
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)	15	407	365	666	480	15	339	0	770	14	51	26
RTOR Reduction (vph)	0	163	0	0	2	0	0	0	468	0	20	0
Lane Group Flow (vph)	15	609	0	666	493	0	339	0	302	14	57	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8			7	7	
Permitted Phases							8		8			
Actuated Green, G (s)	1.6	28.7		22.3	49.4		25.9		25.9	7.1	7.1	
Effective Green, g (s)	1.6	28.7		22.3	49.4		25.9		25.9	7.1	7.1	
Actuated g/C Ratio	0.02	0.29		0.22	0.49		0.26		0.26	0.07	0.07	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	26	869		705	1603		819		378	116	116	
v/s Ratio Prot	0.01	c0.20		c0.21	0.15		0.11			0.01	c0.03	
v/s Ratio Perm									c0.21			
v/c Ratio	0.58	0.70		0.94	0.31		0.41		0.80	0.12	0.49	
Uniform Delay, d1	48.9	31.8		38.2	15.1		30.8		34.6	43.5	44.7	
Progression Factor	1.00	1.00		0.71	1.31		1.00		1.00	1.00	1.00	
Incremental Delay, d2	17.8	4.7		16.0	0.3		0.1		10.5	0.2	1.2	
Delay (s)	66.6	36.5		43.3	20.1		30.9		45.1	43.7	45.9	
Level of Service	E	D		D	C		C		D	D	D	
Approach Delay (s)		37.1			33.4			40.7			45.5	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM Average Control Delay	37.3	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	83.9%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
77: US 101 SB Ramps (realigned) & Talmage Road

6/22/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1022	122	27	437	671	186
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	*0.65		1.00	1.00	0.97	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	2195		1630	1716	3162	1458
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	2195		1630	1716	3162	1458
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1111	133	29	475	729	202
RTOR Reduction (vph)	6	0	0	0	0	60
Lane Group Flow (vph)	1238	0	29	475	729	142
Turn Type	NA		Prot	NA	NA	pm+ov
Protected Phases	2		1	6	8	1
Permitted Phases						8
Actuated Green, G (s)	58.1		5.1	67.2	24.8	29.9
Effective Green, g (s)	58.1		5.1	67.2	24.8	29.9
Actuated g/C Ratio	0.58		0.05	0.67	0.25	0.30
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1275		83	1153	784	494
v/s Ratio Prot	c0.56		0.02	c0.28	c0.23	0.01
v/s Ratio Perm						0.08
v/c Ratio	0.97		0.35	0.41	0.93	0.29
Uniform Delay, d1	20.1		45.8	7.4	36.7	26.9
Progression Factor	0.76		1.00	1.00	1.00	1.00
Incremental Delay, d2	13.3		2.5	1.1	17.2	0.3
Delay (s)	28.6		48.4	8.5	53.9	27.2
Level of Service	C		D	A	D	C
Approach Delay (s)	28.6			10.8	48.1	
Approach LOS	C			B	D	

Intersection Summary				
HCM Average Control Delay	32.1	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.93			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	62.3%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: State Street & Washington Avenue/Hastings Avenue

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	181	207	50	50	54	83	34	615	131	131	532	160
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	
Frt	1.00	0.97		1.00	0.91		1.00	0.97		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)	1630	1665		1630	1560		1630	1670		1630	3147	
Flt Permitted	0.59	1.00		0.33	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1012	1665		560	1560		1630	1670		1630	3147	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	191	218	53	53	57	87	36	647	138	138	560	168
RTOR Reduction (vph)	0	10	0	0	63	0	0	8	0	0	28	0
Lane Group Flow (vph)	191	261	0	53	81	0	36	777	0	138	700	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	19.0	19.0		19.0	19.0		3.5	49.7		9.0	55.2	
Effective Green, g (s)	19.0	19.0		19.0	19.0		3.5	49.7		9.0	55.2	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.04	0.55		0.10	0.62	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	214	353		119	330		64	925		164	1937	
v/s Ratio Prot		0.16			0.05		0.02	c0.47		c0.08	0.22	
v/s Ratio Perm	c0.19			0.09								
v/c Ratio	0.89	0.74		0.45	0.25		0.56	0.84		0.84	0.36	
Uniform Delay, d1	34.4	33.0		30.8	29.4		42.3	16.7		39.6	8.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	33.9	7.9		2.6	0.4		10.8	9.1		30.4	0.5	
Delay (s)	68.2	40.9		33.4	29.8		53.2	25.8		70.0	9.1	
Level of Service	E	D		C	C		D	C		E	A	
Approach Delay (s)		52.2			30.8			27.0			18.8	
Approach LOS		D			C			C			B	

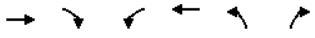
Intersection Summary				
HCM Average Control Delay	29.2	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	84.5%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: Airport Park Boulevard & Talmage Road

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	250	132	418	476	15	124	0	237	9	30	17
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00		1.00		0.85	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)	1630	3091		3162	3245		3162		1458	1630	1623	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3091		3162	3245		3162		1458	1630	1623	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	263	139	440	501	16	131	0	249	9	32	18
RTOR Reduction (vph)	0	51	0	0	2	0	0	0	220	0	16	0
Lane Group Flow (vph)	8	351	0	440	515	0	131	0	29	9	34	0
Turn Type	Prot	NA		Prot	NA		custom		custom	Split	NA	
Protected Phases	5	2		1	6		8			7	7	
Permitted Phases							8		8			
Actuated Green, G (s)	0.8	45.0		18.0	62.2		11.5		11.5	9.5	9.5	
Effective Green, g (s)	0.8	45.0		18.0	62.2		11.5		11.5	9.5	9.5	
Actuated g/C Ratio	0.01	0.45		0.18	0.62		0.12		0.12	0.10	0.10	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	13	1391		569	2018		364		168	155	154	
v/s Ratio Prot	0.00	0.11		c0.14	c0.16		c0.04			0.01	c0.02	
v/s Ratio Perm									0.02			
v/c Ratio	0.62	0.25		0.77	0.26		0.36		0.17	0.06	0.22	
Uniform Delay, d1	49.4	17.1		39.1	8.5		40.9		39.9	41.2	41.8	
Progression Factor	1.00	1.00		0.97	1.32		1.00		1.00	1.00	1.00	
Incremental Delay, d2	48.2	0.4		5.3	0.3		0.2		0.2	0.1	0.3	
Delay (s)	97.6	17.5		43.3	11.5		41.1		40.1	41.2	42.1	
Level of Service	F	B		D	B		D		D	D	D	
Approach Delay (s)		19.1			26.1			40.4			42.0	
Approach LOS		B			C			D			D	

Intersection Summary				
HCM Average Control Delay	28.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.37			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	45.5%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	458	66	45	374	527	137
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	*0.65		1.00	1.00	0.97	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	2188		1630	1716	3162	1458
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	2188		1630	1716	3162	1458
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	482	69	47	394	555	144
RTOR Reduction (vph)	13	0	0	0	0	93
Lane Group Flow (vph)	538	0	47	394	555	51
Turn Type	NA		Prot	NA	NA	pm+ov
Protected Phases	2		1	6	8	1
Permitted Phases						8
Actuated Green, G (s)	20.3		3.9	28.2	13.8	17.7
Effective Green, g (s)	20.3		3.9	28.2	13.8	17.7
Actuated g/C Ratio	0.41		0.08	0.56	0.28	0.35
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	888		127	968	873	633
v/s Ratio Prot	c0.25		0.03	c0.23	c0.18	0.01
v/s Ratio Perm						0.03
v/c Ratio	0.61		0.37	0.41	0.64	0.08
Uniform Delay, d1	11.7		21.9	6.2	15.9	10.7
Progression Factor	0.85		1.00	1.00	1.00	1.00
Incremental Delay, d2	2.9		1.8	1.3	1.5	0.1
Delay (s)	12.9		23.7	7.4	17.4	10.8
Level of Service	B		C	A	B	B
Approach Delay (s)	12.9			9.2	16.1	
Approach LOS	B			A	B	

Intersection Summary				
HCM Average Control Delay	13.2	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	45.7%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
4: Washington Avenue & State Street

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	159	86	31	148	65	125	37	612	140	150	589	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	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	
Frt	1.00	0.96		1.00	0.90		1.00	0.97		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)	1630	1647		1630	1546		1630	1668		1630	3166	
Flt Permitted	0.47	1.00		0.63	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	807	1647		1084	1546		1630	1668		1630	3166	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	167	91	33	156	68	132	39	644	147	158	620	147
RTOR Reduction (vph)	0	15	0	0	79	0	0	9	0	0	21	0
Lane Group Flow (vph)	167	109	0	156	121	0	39	782	0	158	746	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	19.4	19.4		19.4	19.4		3.6	49.7		10.0	56.1	
Effective Green, g (s)	19.4	19.4		19.4	19.4		3.6	49.7		10.0	56.1	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.04	0.55		0.11	0.62	
Clearance Time (s)	4.0	4.0		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		3.0	3.0	
Lane Grp Cap (vph)	172	351		231	329		64	910		179	1950	
v/s Ratio Prot		0.07			0.08		0.02	c0.47		c0.10	0.24	
v/s Ratio Perm	c0.21			0.14								
v/c Ratio	0.97	0.31		0.68	0.37		0.61	0.86		0.88	0.38	
Uniform Delay, d1	35.6	30.2		33.0	30.6		43.1	17.7		40.0	8.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	59.8	0.5		7.6	0.7		15.3	10.4		36.2	0.6	
Delay (s)	95.3	30.7		40.5	31.3		58.4	28.1		76.2	9.4	
Level of Service	F	C		D	C		E	C		E	A	
Approach Delay (s)		67.8			35.4			29.5			20.8	
Approach LOS		E			D			C			C	

Intersection Summary				
HCM Average Control Delay	31.7	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.89			
Actuated Cycle Length (s)	91.1	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	88.2%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
6: Talmage Road & Airport Park Boulevard

6/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	381	386	614	447	14	372	0	814	13	47	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		0.97	0.95		0.97		1.00	1.00	1.00	
Frt	1.00	0.92		1.00	1.00		1.00		0.85	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)	1630	3014		3162	3245		3162		1458	1630	1629	
Flt Permitted	0.95	1.00		0.95	1.00		0.95		1.00	0.95	1.00	
Satd. Flow (perm)	1630	3014		3162	3245		3162		1458	1630	1629	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	401	406	646	471	15	392	0	857	14	49	25
RTOR Reduction (vph)	0	177	0	0	2	0	0	0	444	0	19	0
Lane Group Flow (vph)	15	630	0	646	484	0	392	0	413	14	55	0
Turn Type	Prot			Prot			custom		custom	Split		
Protected Phases	5	2		1	6		8			7	7	
Permitted Phases							8		8			
Actuated Green, G (s)	1.6	23.2		21.0	42.6		33.9		33.9	9.9	9.9	
Effective Green, g (s)	1.6	23.2		21.0	42.6		33.9		33.9	9.9	9.9	
Actuated g/C Ratio	0.02	0.22		0.20	0.41		0.33		0.33	0.10	0.10	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	4.0	4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0		2.0	2.0	2.0	
Lane Grp Cap (vph)	25	672		638	1329		1031		475	155	155	
v/s Ratio Prot	0.01	c0.21		c0.20	0.15		0.12			0.01	c0.03	
v/s Ratio Perm									c0.28			
v/c Ratio	0.60	0.94		1.01	0.36		0.38		0.87	0.09	0.35	
Uniform Delay, d1	50.9	39.7		41.5	21.3		27.0		33.0	42.9	44.1	
Progression Factor	1.00	1.00		0.82	1.33		1.00		1.00	1.00	1.00	
Incremental Delay, d2	23.2	22.3		33.2	0.5		0.1		15.0	0.1	0.5	
Delay (s)	74.0	62.0		67.2	28.8		27.1		48.0	43.0	44.6	
Level of Service	E	E		E	C		C		D	D	D	
Approach Delay (s)		62.2			50.7			41.4			44.3	
Approach LOS		E			D			D			D	

Intersection Summary				
HCM Average Control Delay	49.9	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.86			
Actuated Cycle Length (s)	104.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	93.0%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis
9: Talmage Road & Hastings Frontage Road

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	488	21	2	464	18	24	3	2	38	2	33
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	53	514	22	2	488	19	25	3	2	40	2	35
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	507			536			1168	1142	525	1136	1143	498
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	507			536			1168	1142	525	1136	1143	498
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			83	98	100	76	99	94
cM capacity (veh/h)	1057			1032			152	190	553	169	190	572

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	588	509	31	77
Volume Left	53	2	25	40
Volume Right	22	19	2	35
cSH	1057	1032	164	249
Volume to Capacity	0.05	0.00	0.19	0.31
Queue Length 95th (ft)	4	0	17	32
Control Delay (s)	1.3	0.1	31.9	25.7
Lane LOS	A	A	D	D
Approach Delay (s)	1.3	0.1	31.9	25.7
Approach LOS			D	D

Intersection Summary				
Average Delay			3.1	
Intersection Capacity Utilization			74.6%	ICU Level of Service
Analysis Period (min)			15	

HCM Signalized Intersection Capacity Analysis
10: Commerce Drive & Airport Park Boulevard

6/21/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	79	185	10	50	69	179	789	14	60	641	72
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.93			0.93		1.00	1.00		1.00	0.98	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1573			1586		1630	3251		1630	3210	
Flt Permitted		0.89			0.97		0.34	1.00		0.29	1.00	
Satd. Flow (perm)		1420			1540		577	3251		502	3210	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	83	195	11	53	73	188	831	15	63	675	76
RTOR Reduction (vph)	0	83	0	0	48	0	0	1	0	0	11	0
Lane Group Flow (vph)	0	279	0	0	89	0	188	845	0	63	740	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		13.6			13.6		25.0	25.0		25.0	25.0	
Effective Green, g (s)		13.6			13.6		25.0	25.0		25.0	25.0	
Actuated g/C Ratio		0.29			0.29		0.54	0.54		0.54	0.54	
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)		414			449		310	1744		269	1722	
v/s Ratio Prot								0.26			0.23	
v/s Ratio Perm		c0.20			0.06		c0.33			0.13		
v/c Ratio		0.67			0.20		0.61	0.48		0.23	0.43	
Uniform Delay, d1		14.5			12.4		7.4	6.8		5.7	6.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		4.3			0.2		3.3	0.2		0.4	0.2	
Delay (s)		18.8			12.6		10.8	7.0		6.2	6.7	
Level of Service		B			B		B	A		A	A	
Approach Delay (s)		18.8			12.6			7.7			6.6	
Approach LOS		B			B			A			A	

Intersection Summary				
HCM Average Control Delay		9.3	HCM Level of Service	A
HCM Volume to Capacity ratio		0.63		
Actuated Cycle Length (s)		46.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization		70.8%	ICU Level of Service	C
Analysis Period (min)		15		
c Critical Lane Group				

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1085	167	23	435	686	196
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	*0.65	1.00	1.00	1.00	0.97	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	0.95	1.00
Satd. Flow (prot)	2230	1458	1630	1716	3162	1458
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	2230	1458	1630	1716	3162	1458
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1142	176	24	458	722	206
RTOR Reduction (vph)	0	28	0	0	0	58
Lane Group Flow (vph)	1142	148	24	458	722	148
Turn Type		pm+ov	Prot			pm+ov
Protected Phases	2	8	1	6	8	1
Permitted Phases		2				8
Actuated Green, G (s)	61.3	87.7	4.3	69.6	26.4	30.7
Effective Green, g (s)	61.3	87.7	4.3	69.6	26.4	30.7
Actuated g/C Ratio	0.59	0.84	0.04	0.67	0.25	0.30
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)	1314	1286	67	1148	803	486
v/s Ratio Prot	c0.51	0.03	0.01	c0.27	c0.23	0.01
v/s Ratio Perm		0.07				0.09
v/c Ratio	0.87	0.12	0.36	0.40	0.90	0.30
Uniform Delay, d1	18.0	1.4	48.5	7.8	37.5	28.4
Progression Factor	0.75	2.05	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.7	0.0	3.3	1.0	12.8	0.4
Delay (s)	17.2	2.9	51.8	8.8	50.3	28.7
Level of Service	B	A	D	A	D	C
Approach Delay (s)	15.3			10.9	45.6	
Approach LOS	B			B	D	

Intersection Summary				
HCM Average Control Delay	24.8	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.86			
Actuated Cycle Length (s)	104.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	60.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Intersection
Queuing Calculations

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	B160
Directions Served	L	T	TR	L	T	TR	L	L	R	L	TR	T
Maximum Queue (ft)	31	212	167	171	94	54	108	82	138	33	80	4
Average Queue (ft)	14	147	85	137	60	29	73	51	88	10	47	1
95th Queue (ft)	37	230	173	193	101	62	117	92	166	37	88	7
Link Distance (ft)		433	433		272			683	683	41	41	271
Upstream Blk Time (%)										1	15	
Queuing Penalty (veh)										0	0	
Storage Bay Dist (ft)	100			160		180	80					
Storage Blk Time (%)		21		6			8	1				
Queuing Penalty (veh)		3		30			9	1				

Intersection: 7: Talmage Road & U.S. 101 SB Ramps

Movement	NB	SB
Directions Served	R	R
Maximum Queue (ft)	109	728
Average Queue (ft)	77	510
95th Queue (ft)	134	964
Link Distance (ft)	1019	1019
Upstream Blk Time (%)		8
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	NB	NB
Directions Served	L	R
Maximum Queue (ft)	74	39
Average Queue (ft)	41	23
95th Queue (ft)	84	49
Link Distance (ft)	966	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		20
Storage Blk Time (%)	16	5
Queuing Penalty (veh)	7	6

Intersection: 77: Talmage Road & U.S. 101 SB On-Ramp

Movement	EB	WB
Directions Served	T	L
Maximum Queue (ft)	125	16
Average Queue (ft)	48	6
95th Queue (ft)	252	26
Link Distance (ft)	272	
Upstream Blk Time (%)	1	
Queuing Penalty (veh)	3	
Storage Bay Dist (ft)		50
Storage Blk Time (%)		0
Queuing Penalty (veh)		0

Zone Summary

Zone wide Queuing Penalty: 60

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	L	R	L	TR
Maximum Queue (ft)	50	233	215	209	82	62	97	70	149	19	78
Average Queue (ft)	17	171	116	163	50	30	71	42	91	4	43
95th Queue (ft)	66	263	228	241	110	65	108	79	167	23	85
Link Distance (ft)		433	433		272			683	683	41	41
Upstream Blk Time (%)				0						1	12
Queuing Penalty (veh)				0						0	0
Storage Bay Dist (ft)	100			160		180	80				
Storage Blk Time (%)		27		8	0		7	1			
Queuing Penalty (veh)		4		40	1		8	1			

Intersection: 7: Talmage Road & U.S. 101 SB Ramps

Movement	NB	SB
Directions Served	R	R
Maximum Queue (ft)	104	1078
Average Queue (ft)	70	683
95th Queue (ft)	125	1181
Link Distance (ft)	1019	1174
Upstream Blk Time (%)		4
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	NB	NB
Directions Served	L	R
Maximum Queue (ft)	69	47
Average Queue (ft)	45	29
95th Queue (ft)	81	55
Link Distance (ft)	966	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		20
Storage Blk Time (%)	23	6
Queuing Penalty (veh)	13	7

Queuing and Blocking Report
Baseline PM Peak Hour
2/1/2012

Intersection: 77: Talmage Road & U.S 101 SB On-Ramp

Movement	WB
Directions Served	L
Maximum Queue (ft)	31
Average Queue (ft)	10
95th Queue (ft)	34
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	50
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Zone Summary

Zone wide Queuing Penalty: 73

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	B160
Directions Served	L	T	TR	L	T	TR	L	L	R	L	TR	T
Maximum Queue (ft)	22	291	266	184	98	63	113	107	235	43	72	4
Average Queue (ft)	9	194	141	136	59	30	85	62	137	16	42	1
95th Queue (ft)	28	310	293	209	109	69	124	114	253	49	79	8
Link Distance (ft)		433	433		272	272		683	683	41	41	271
Upstream Blk Time (%)										7	10	
Queuing Penalty (veh)										0	0	
Storage Bay Dist (ft)	100			160			80					
Storage Blk Time (%)		30		6			12	6				
Queuing Penalty (veh)		4		14			17	8				

Intersection: 7: Talmage Road & U.S. 101 SB Ramps

Movement	NB	SB
Directions Served	R	R
Maximum Queue (ft)	228	1161
Average Queue (ft)	155	842
95th Queue (ft)	335	1385
Link Distance (ft)	1019	1182
Upstream Blk Time (%)		19
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	NB	NB
Directions Served	L	R
Maximum Queue (ft)	59	48
Average Queue (ft)	38	26
95th Queue (ft)	64	55
Link Distance (ft)	966	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		20
Storage Blk Time (%)	16	5
Queuing Penalty (veh)	7	5

Queuing and Blocking Report
Future PM Peak Hour
6/21/2012

Intersection: 77: Talmage Road & U.S 101 SB On-Ramp

Movement	EB	EB	WB
Directions Served	T	R	L
Maximum Queue (ft)	63	4	26
Average Queue (ft)	13	1	8
95th Queue (ft)	124	7	31
Link Distance (ft)	272	272	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			50
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

Zone Summary

Zone wide Queuing Penalty: 57

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	B160
Directions Served	L	T	TR	L	T	TR	L	L	R	L	TR	T
Maximum Queue (ft)	23	255	235	252	185	77	117	137	262	36	80	3
Average Queue (ft)	7	169	121	199	108	28	88	73	156	14	49	1
95th Queue (ft)	29	265	241	283	279	104	129	149	304	45	87	7
Link Distance (ft)		433	433		272			683	683	41	41	271
Upstream Blk Time (%)				0	3	0				3	12	
Queuing Penalty (veh)				0	36	0				0	0	
Storage Bay Dist (ft)	100			160		180	80					
Storage Blk Time (%)		26		20			21	5				
Queuing Penalty (veh)		4		88			33	8				

Intersection: 7: Talmage Road & U.S. 101 SB Ramps

Movement	EB	WB	NB	SB
Directions Served	T	T	R	R
Maximum Queue (ft)	4	23	163	1037
Average Queue (ft)	1	6	105	898
95th Queue (ft)	8	49	194	1241
Link Distance (ft)	132	349	1019	1019
Upstream Blk Time (%)				52
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	EB	NB	NB
Directions Served	T	L	R
Maximum Queue (ft)	5	79	41
Average Queue (ft)	1	50	21
95th Queue (ft)	10	86	52
Link Distance (ft)	271	966	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			20
Storage Blk Time (%)		23	5
Queuing Penalty (veh)		10	7

Intersection: 77: Talmage Road & U.S. 101 SB On-Ramp

Movement	EB	WB	WB
Directions Served	T	L	T
Maximum Queue (ft)	188	31	27
Average Queue (ft)	62	12	18
95th Queue (ft)	290	36	96
Link Distance (ft)	272		132
Upstream Blk Time (%)	1		1
Queuing Penalty (veh)	3		12
Storage Bay Dist (ft)		50	
Storage Blk Time (%)		0	2
Queuing Penalty (veh)		0	0

Zone Summary

Zone wide Queuing Penalty: 201

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	L	R	L	TR
Maximum Queue (ft)	45	251	237	259	312	111	117	124	271	28	70
Average Queue (ft)	18	186	130	224	154	35	91	80	176	15	47
95th Queue (ft)	84	283	267	297	359	137	137	144	301	41	88
Link Distance (ft)		433	433		272			683	683	41	41
Upstream Blk Time (%)				2	6	0				1	17
Queuing Penalty (veh)				0	67	0				0	0
Storage Bay Dist (ft)	100			160		180	80				
Storage Blk Time (%)		33		28			18	6			
Queuing Penalty (veh)		5		130			28	10			

Intersection: 7: Talmage Road & U.S. 101 SB Ramps

Movement	WB	NB	SB
Directions Served	T	R	R
Maximum Queue (ft)	24	242	1192
Average Queue (ft)	7	160	1019
95th Queue (ft)	45	356	1417
Link Distance (ft)	347	1019	1174
Upstream Blk Time (%)			45
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	NB	NB
Directions Served	L	R
Maximum Queue (ft)	67	42
Average Queue (ft)	46	33
95th Queue (ft)	74	54
Link Distance (ft)	966	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		20
Storage Blk Time (%)	28	9
Queuing Penalty (veh)	15	12

Intersection: 77: Talmage Road & U.S 101 SB On-Ramp

Movement	EB	EB	WB	WB
Directions Served	T	R	L	T
Maximum Queue (ft)	310	4	26	101
Average Queue (ft)	98	1	12	32
95th Queue (ft)	367	7	36	126
Link Distance (ft)	272	272		131
Upstream Blk Time (%)	1			2
Queuing Penalty (veh)	5			27
Storage Bay Dist (ft)			50	
Storage Blk Time (%)			0	5
Queuing Penalty (veh)			0	1

Zone Summary

Zone wide Queuing Penalty: 300

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	B160
Directions Served	L	T	TR	L	T	TR	L	L	R	L	TR	T
Maximum Queue (ft)	27	281	288	255	260	78	121	183	242	38	84	6
Average Queue (ft)	12	192	183	206	134	27	103	101	166	16	46	1
95th Queue (ft)	39	346	363	291	322	101	134	222	268	47	93	12
Link Distance (ft)		433	433		272	272		683	683	41	41	271
Upstream Blk Time (%)		0	1	0	4					4	14	
Queuing Penalty (veh)		2	5	0	22					0	0	
Storage Bay Dist (ft)	100			160			80					
Storage Blk Time (%)		33		21			24	9				
Queuing Penalty (veh)		5		47			45	17				

Intersection: 7: Talmage Road & U.S. 101 SB Ramps

Movement	EB	WB	NB	SB
Directions Served	T	T	R	R
Maximum Queue (ft)	3	10	203	1180
Average Queue (ft)	1	2	147	1015
95th Queue (ft)	5	14	242	1425
Link Distance (ft)	131	348	1019	1182
Upstream Blk Time (%)				39
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	NB	NB
Directions Served	L	R
Maximum Queue (ft)	76	48
Average Queue (ft)	47	29
95th Queue (ft)	84	55
Link Distance (ft)	966	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		20
Storage Blk Time (%)	24	6
Queuing Penalty (veh)	11	8

Queuing and Blocking Report
Future plus Project PM Peak Hour 6/21/2012

Intersection: 77: Talmage Road & U.S 101 SB On-Ramp

Movement	EB	EB	WB	WB
Directions Served	T	R	L	T
Maximum Queue (ft)	117	7	29	96
Average Queue (ft)	35	1	14	21
95th Queue (ft)	207	10	40	103
Link Distance (ft)	272	272		131
Upstream Blk Time (%)	0			1
Queuing Penalty (veh)	1			15
Storage Bay Dist (ft)			50	
Storage Blk Time (%)			0	3
Queuing Penalty (veh)			3	1

Zone Summary

Zone wide Queuing Penalty: 182

Queuing and Blocking Report
Baseline PM Peak Hour (Mitigated Option A) 6/22/2012

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	L	T	TR	L	L	R	L	TR
Maximum Queue (ft)	48	172	174	176	173	144	131	109	81	119	31	88
Average Queue (ft)	16	125	111	106	109	86	68	77	47	88	13	56
95th Queue (ft)	64	200	193	187	183	166	150	124	84	139	43	107
Link Distance (ft)		434	434			278	278		677	677	91	91
Upstream Blk Time (%)												5
Queuing Penalty (veh)												0
Storage Bay Dist (ft)	100			225	225			80				
Storage Blk Time (%)		18		0				11	2			
Queuing Penalty (veh)		2		1				12	3			

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	NB	NB
Directions Served	L	R
Maximum Queue (ft)	69	42
Average Queue (ft)	45	29
95th Queue (ft)	75	52
Link Distance (ft)	966	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		20
Storage Blk Time (%)	20	7
Queuing Penalty (veh)	11	8

Intersection: 77: Talmage Road & US 101 SB Ramps (realigned)

Movement	EB	EB	WB	WB	NB	NB	NB
Directions Served	T	TR	L	T	L	L	R
Maximum Queue (ft)	250	234	51	154	255	203	85
Average Queue (ft)	157	117	26	91	195	143	56
95th Queue (ft)	286	287	57	170	284	221	97
Link Distance (ft)	278	278		126		731	
Upstream Blk Time (%)	1	1		3			
Queuing Penalty (veh)	2	5		11			
Storage Bay Dist (ft)			50		800		300
Storage Blk Time (%)			5	13			
Queuing Penalty (veh)			20	3			

Zone Summary

Zone wide Queuing Penalty: 78

Queuing and Blocking Report
Future PM (Mitigated Option A) 6/22/2012

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	L	T	TR	L	L	R	L	TR
Maximum Queue (ft)	30	261	286	186	191	199	148	122	156	236	35	78
Average Queue (ft)	15	173	174	119	121	126	91	93	88	137	11	45
95th Queue (ft)	39	303	322	207	220	226	164	140	190	245	40	101
Link Distance (ft)		434	434			280	280		680	680	82	82
Upstream Blk Time (%)			0		0	0						2
Queuing Penalty (veh)			1		0	1						0
Storage Bay Dist (ft)	100			225	225			80				
Storage Blk Time (%)		28		1	1			21	10			
Queuing Penalty (veh)		4		2	2			30	14			

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	NB	NB
Directions Served	L	R
Maximum Queue (ft)	67	40
Average Queue (ft)	47	22
95th Queue (ft)	83	53
Link Distance (ft)	967	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		20
Storage Blk Time (%)	24	4
Queuing Penalty (veh)	11	4

Intersection: 77: Talmage Road & US 101 SB Ramps (realigned)

Movement	EB	EB	WB	WB	NB	NB	NB
Directions Served	T	TR	L	T	L	L	R
Maximum Queue (ft)	259	256	40	136	248	206	113
Average Queue (ft)	196	154	25	80	176	138	67
95th Queue (ft)	303	321	53	155	281	221	142
Link Distance (ft)	280	280		127		1097	
Upstream Blk Time (%)	1	3		1			
Queuing Penalty (veh)	4	13		6			
Storage Bay Dist (ft)			50		800		300
Storage Blk Time (%)			5	12			
Queuing Penalty (veh)			21	3			

Zone Summary

Zone wide Queuing Penalty: 115

Queuing and Blocking Report
Existing plus Project PM Peak Hour (Mitigated Option A) 6/22/2012

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	L	T	TR	L	L	R	L	TR
Maximum Queue (ft)	27	165	192	177	187	146	114	101	119	261	21	72
Average Queue (ft)	12	144	166	151	162	119	83	94	82	204	11	53
95th Queue (ft)	38	200	268	235	231	203	152	130	162	360	40	98
Link Distance (ft)		434	434			278	278		677	677	98	98
Upstream Blk Time (%)					0	0						3
Queuing Penalty (veh)					0	2						0
Storage Bay Dist (ft)	100			225	225			80				
Storage Blk Time (%)		29		1	2			18	7			
Queuing Penalty (veh)		3		2	3			23	9			

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	EB	NB	NB
Directions Served	T	L	R
Maximum Queue (ft)	4	64	38
Average Queue (ft)	1	46	33
95th Queue (ft)	8	87	55
Link Distance (ft)	271	966	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			20
Storage Blk Time (%)		23	7
Queuing Penalty (veh)		9	8

Intersection: 77: Talmage Road & US 101 SB Ramps (realigned)

Movement	EB	EB	WB	WB	B7	NB	NB	NB
Directions Served	T	TR	L	T	T	L	L	R
Maximum Queue (ft)	227	253	42	150	9	441	312	94
Average Queue (ft)	241	226	19	108	2	453	241	64
95th Queue (ft)	291	377	59	187	20	688	430	128
Link Distance (ft)	278	278		126	358		731	
Upstream Blk Time (%)	4	8		3		1		
Queuing Penalty (veh)	19	34		9		0		
Storage Bay Dist (ft)			50			800		300
Storage Blk Time (%)			2	17		1	0	
Queuing Penalty (veh)			6	3		3	1	

Zone Summary

Zone wide Queuing Penalty: 133

Queuing and Blocking Report
Baseline PM plus Project (Mitigated Option A) 6/22/2012

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	L	T	TR	L	L	R	L	TR
Maximum Queue (ft)	47	177	246	242	252	254	133	115	170	271	24	83
Average Queue (ft)	18	116	144	188	203	135	71	96	103	161	6	50
95th Queue (ft)	68	192	275	275	295	303	149	132	226	370	26	109
Link Distance (ft)		434	434			278	278		677	677	98	98
Upstream Blk Time (%)					1	2						5
Queuing Penalty (veh)					0	13						0
Storage Bay Dist (ft)	100			225	225			80				
Storage Blk Time (%)		14		4	5	0		22	7			
Queuing Penalty (veh)		2		8	12	1		34	11			

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	NB	NB
Directions Served	L	R
Maximum Queue (ft)	69	47
Average Queue (ft)	44	29
95th Queue (ft)	74	59
Link Distance (ft)	966	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		20
Storage Blk Time (%)	25	9
Queuing Penalty (veh)	14	13

Intersection: 77: Talmage Road & US 101 SB Ramps (realigned)

Movement	EB	EB	WB	WB	NB	NB	NB
Directions Served	T	TR	L	T	L	L	R
Maximum Queue (ft)	271	282	44	160	508	418	135
Average Queue (ft)	213	192	18	102	371	251	75
95th Queue (ft)	305	338	52	183	640	558	164
Link Distance (ft)	278	278		126		731	
Upstream Blk Time (%)	2	2		3	1	0	
Queuing Penalty (veh)	14	11		14	0	0	
Storage Bay Dist (ft)			50		800		300
Storage Blk Time (%)			5	16	1	1	
Queuing Penalty (veh)			22	4	4	3	

Zone Summary

Zone wide Queuing Penalty: 181

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	L	T	TR	L	L	R	L	TR
Maximum Queue (ft)	51	241	354	219	244	279	147	120	341	475	32	83
Average Queue (ft)	16	159	228	186	199	191	96	99	152	317	15	51
95th Queue (ft)	70	257	379	274	295	346	160	137	409	591	45	99
Link Distance (ft)		434	434			280	280		668	668	35	35
Upstream Blk Time (%)			1		2	7					7	35
Queuing Penalty (veh)			3		0	37					0	0
Storage Bay Dist (ft)	100			225	225			80				
Storage Blk Time (%)		21		8	9			22	9			
Queuing Penalty (veh)		3		19	21			42	16			

Intersection: 6: Talmage Road & Airport Park Boulevard

Movement	B160
Directions Served	T
Maximum Queue (ft)	4
Average Queue (ft)	1
95th Queue (ft)	8
Link Distance (ft)	271
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Talmage Road & U.S. 101 NB Ramps

Movement	EB	NB	NB
Directions Served	TR	L	R
Maximum Queue (ft)	23	123	45
Average Queue (ft)	7	83	33
95th Queue (ft)	35	149	58
Link Distance (ft)	255	965	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			20
Storage Blk Time (%)		54	6
Queuing Penalty (veh)		24	9

Intersection: 77: Talmage Road & US 101 SB Ramps (realigned)

Movement	EB	EB	EB	WB	WB	B7	NB	NB	NB
Directions Served	T	T	R	L	T	T	L	L	R
Maximum Queue (ft)	273	264	72	58	120	25	445	291	144
Average Queue (ft)	228	204	18	28	87	6	347	208	82
95th Queue (ft)	315	347	111	70	189	51	601	426	219
Link Distance (ft)	280	280	280		127	345		1084	
Upstream Blk Time (%)	2	3			4				
Queuing Penalty (veh)	9	11			20				
Storage Bay Dist (ft)				50			800		300
Storage Blk Time (%)				8	17			7	
Queuing Penalty (veh)				35	4			35	

Zone Summary

Zone wide Queuing Penalty: 288

Appendix B

Collision Rate Calculations

INTERSECTION COLLISION RATE CALCULATIONS

Costco EIR for the City of Ukiah

Intersection # 1: South State Street & Mill Street

Date of Count: Thursday, February 11, 2010

Number of Collisions: 18
Number of Injuries: 10
Number of Fatalities: 0
ADT: 17800
Start Date: January 1, 2006
End Date: December 31, 2010
Number of Years: 5

Intersection Type: FOUR-LEGGED
Control Type: SIGNALS
Area: URBAN

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS} \times 1\ \text{MILLION}}{\text{ADT} \times 365\ \text{DAYS PER YEAR} \times \text{NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{18 \times 1{,}000{,}000}{17{,}800 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.55 c/mve**	**0.0%**	**55.6%**
Statewide Average*	**0.43 c/mve**	**0.4%**	**43.9%**

ADT = average daily total vehicles entering intersection (adjusted for seasonal & weekday changes)
c/mve = collisions per million vehicles entering intersection
* *2007 Collision Data on California State Highways*, Caltrans

Intersection # 2: South State Street & Gobbi Street

Date of Count: Thursday, February 11, 2010

Number of Collisions: 8
Number of Injuries: 5
Number of Fatalities: 0
ADT: 24500
Start Date: January 1, 2006
End Date: December 31, 2010
Number of Years: 5

Intersection Type: FOUR-LEGGED
Control Type: SIGNALS
Area: URBAN

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS} \times 1\ \text{MILLION}}{\text{ADT} \times 365\ \text{DAYS PER YEAR} \times \text{NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{8 \times 1{,}000{,}000}{24{,}500 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.18 c/mve**	**0.0%**	**62.5%**
Statewide Average*	**0.43 c/mve**	**0.4%**	**43.9%**

ADT = average daily total vehicles entering intersection (adjusted for seasonal & weekday changes)
c/mve = collisions per million vehicles entering intersection
* *2007 Collision Data on California State Highways*, Caltrans

INTERSECTION COLLISION RATE CALCULATIONS

Costco EIR for the City of Ukiah

Intersection # 3: South State Street & Talmage Road

Date of Count: Wednesday, February 17, 2010

Number of Collisions: 13
Number of Injuries: 6
Number of Fatalities: 0
ADT: 19900
Start Date: January 1, 2006
End Date: December 31, 2010
Number of Years: 5

Intersection Type: TEE
Control Type: SIGNALS
Area: URBAN

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS x 1 MILLION}}{\text{ADT x 365 DAYS PER YEAR x NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{13 \times 1{,}000{,}000}{19{,}900 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.36 c/mve**	**0.0%**	**46.2%**
Statewide Average*	**0.28 c/mve**	**0.4%**	**43.3%**

ADT = average daily total vehicles entering intersection (adjusted for seasonal & weekday changes)
c/mve = collisions per million vehicles entering intersection
* *2007 Collision Data on California State Highways*, Caltrans

Intersection # 4: South State Street & Hastings Avenue

Date of Count: Thursday, February 11, 2010

Number of Collisions: 4
Number of Injuries: 0
Number of Fatalities: 0
ADT: 18300
Start Date: January 1, 2006
End Date: December 31, 2010
Number of Years: 5

Intersection Type: FOUR-LEGGED
Control Type: SIGNALS
Area: URBAN

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS x 1 MILLION}}{\text{ADT x 365 DAYS PER YEAR x NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{4 \times 1{,}000{,}000}{18{,}300 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.12 c/mve**	**0.0%**	**0.0%**
Statewide Average*	**0.43 c/mve**	**0.4%**	**43.9%**

ADT = average daily total vehicles entering intersection (adjusted for seasonal & weekday changes)
c/mve = collisions per million vehicles entering intersection
* *2007 Collision Data on California State Highways*, Caltrans

INTERSECTION COLLISION RATE CALCULATIONS

Costco EIR for the City of Ukiah

Intersection # 5: Talmage Road & Waugh Lane

Date of Count: Thursday, February 11, 2010

Number of Collisions: 6
Number of Injuries: 2
Number of Fatalities: 0
ADT: 18000
Start Date: January 1, 2006
End Date: December 31, 2010
Number of Years: 5

Intersection Type: FOUR-LEGGED
Control Type: STOP & YIELD SIGNS
Area: URBAN

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS x 1 MILLION}}{\text{ADT x 365 DAYS PER YEAR x NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{6 \times 1{,}000{,}000}{18{,}000 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.18 c/mve**	**0.0%**	**33.3%**
Statewide Average*	**0.22 c/mve**	**0.7%**	**42.2%**

ADT = average daily total vehicles entering intersection (adjusted for seasonal & weekday changes)
c/mve = collisions per million vehicles entering intersection
* *2007 Collision Data on California State Highways*, Caltrans

Intersection # 6: Talmage Road & Airport Park Boulevard

Date of Count: Wednesday, February 10, 2010

Number of Collisions: 9
Number of Injuries: 5
Number of Fatalities: 0
ADT: 24700
Start Date: January 1, 2006
End Date: December 31, 2010
Number of Years: 5

Intersection Type: FOUR-LEGGED
Control Type: SIGNALS
Area: URBAN

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS x 1 MILLION}}{\text{ADT x 365 DAYS PER YEAR x NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{9 \times 1{,}000{,}000}{24{,}700 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.20 c/mve**	**0.0%**	**55.6%**
Statewide Average*	**0.43 c/mve**	**0.4%**	**43.9%**

ADT = average daily total vehicles entering intersection (adjusted for seasonal & weekday changes)
c/mve = collisions per million vehicles entering intersection
* *2007 Collision Data on California State Highways*, Caltrans

INTERSECTION COLLISION RATE CALCULATIONS

Costco EIR for the City of Ukiah

Intersection # 7: Talmage Road & US 101 Southbound Off-Ramp

Date of Count: Thursday, February 11, 2010

Number of Collisions: 2
Number of Injuries: 0
Number of Fatalities: 0
ADT: 21500
Start Date: January 1, 2006
End Date: December 31, 2010
Number of Years: 5

Intersection Type: TEE
Control Type: STOP & YIELD SIGNS
Area: URBAN

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS x 1 MILLION}}{\text{ADT x 365 DAYS PER YEAR x NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{2 \times 1{,}000{,}000}{21{,}500 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.05 c/mve**	**0.0%**	**0.0%**
Statewide Average*	**0.14 c/mve**	**0.8%**	**42.4%**

ADT = average daily total vehicles entering intersection (adjusted for seasonal & weekday changes)
c/mve = collisions per million vehicles entering intersection
* *2007 Collision Data on California State Highways*, Caltrans

Intersection # 8: Talmage Road & US 101 Northbound Off-Ramp

Date of Count: Thursday, February 11, 2010

Number of Collisions: 1
Number of Injuries: 1
Number of Fatalities: 0
ADT: 17200
Start Date: January 1, 2006
End Date: December 31, 2010
Number of Years: 5

Intersection Type: TEE
Control Type: STOP & YIELD SIGNS
Area: URBAN

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS x 1 MILLION}}{\text{ADT x 365 DAYS PER YEAR x NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{1 \times 1{,}000{,}000}{17{,}200 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.03 c/mve**	**0.0%**	**100.0%**
Statewide Average*	**0.14 c/mve**	**0.8%**	**42.4%**

ADT = average daily total vehicles entering intersection (adjusted for seasonal & weekday changes)
c/mve = collisions per million vehicles entering intersection
* *2007 Collision Data on California State Highways*, Caltrans

INTERSECTION COLLISION RATE CALCULATIONS

Costco EIR for the City of Ukiah

Intersection # 9: Talmage Road & Hastings Frontage Road

Date of Count: Thursday, February 11, 2010

Number of Collisions: 3
Number of Injuries: 5
Number of Fatalities: 0
ADT: 10500
Start Date: January 1, 2006
End Date: December 31, 2010
Number of Years: 5

Intersection Type: FOUR-LEGGED
Control Type: STOP & YIELD SIGNS
Area: URBAN

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS x 1 MILLION}}{\text{ADT x 365 DAYS PER YEAR x NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{3 \times 1{,}000{,}000}{10{,}500 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.16 c/mve**	**0.0%**	**166.7%**
Statewide Average*	**0.22 c/mve**	**0.7%**	**42.2%**

ADT = average daily total vehicles entering intersection (adjusted for seasonal & weekday changes)
c/mve = collisions per million vehicles entering intersection
* *2007 Collision Data on California State Highways*, Caltrans

Intersection # 10: Airport Park Boulevard & Commerce Drive

Date of Count: Wednesday, February 10, 2010

Number of Collisions: 5
Number of Injuries: 3
Number of Fatalities: 0
ADT: 11400
Start Date: January 1, 2006
End Date: December 31, 2010
Number of Years: 5

Intersection Type: FOUR-LEGGED
Control Type: 4 WAY STOP
Area: URBAN

$$\text{collision rate} = \frac{\text{NUMBER OF COLLISIONS x 1 MILLION}}{\text{ADT x 365 DAYS PER YEAR x NUMBER OF YEARS}}$$

$$\text{collision rate} = \frac{5 \times 1{,}000{,}000}{11{,}400 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.24 c/mve**	**0.0%**	**60.0%**
Statewide Average*	**0.41 c/mve**	**0.5%**	**45.0%**

ADT = average daily total vehicles entering intersection (adjusted for seasonal & weekday changes)
c/mve = collisions per million vehicles entering intersection
* *2007 Collision Data on California State Highways*, Caltrans

Appendix C

Freeway Level of Service Calculations

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	CH	Highway/Direction of Travel	US 101 Northbound
Agency or Company	W-Trans	From/To	South State St to Talmage Rd
Date Performed	2/8/2012	Jurisdiction	City of Ukiah/Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing

Project Description: Costco Environmental Impact Report

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs					
Volume, V	676	veh/h	Peak-Hour Factor, PHF	0.95	
AADT		veh/day	%Trucks and Buses, P_T	8	
Peak-Hr Prop. of AADT, K			%RVs, P_R	3	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	

Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.956

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	0.73	ramps/mi	TRD Adjustment	2.5	mph
FFS (measured)		mph	FFS	72.9	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	372	pc/h/ln	Design LOS		
S	75.0	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
D = v_p / S	5.0	pc/mi/ln	S		mph
LOS	A		D = v_p / S		pc/mi/ln
			Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	CH	Highway/Direction of Travel	US 101 Southbound
Agency or Company	W-Trans	From/To	South State St to Talmage Rd
Date Performed	2/8/2012	Jurisdiction	City of Ukiah/Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing

Project Description: Costco Environmental Impact Report

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs					
Volume, V	669	veh/h	Peak-Hour Factor, PHF	0.95	
AADT		veh/day	%Trucks and Buses, P_T	8	
Peak-Hr Prop. of AADT, K			%RVs, P_R	3	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	

Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.956

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	0.73	ramps/mi	TRD Adjustment	2.5	mph
FFS (measured)		mph	FFS	72.9	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	368	pc/h/ln	Design LOS		
S	75.0	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
D = v_p / S	4.9	pc/mi/ln	S		mph
LOS	A		D = v_p / S		pc/mi/ln
			Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	CH	Highway/Direction of Travel	US 101 Northbound
Agency or Company	W-Trans	From/To	Talmage Rd to E Gobbi St
Date Performed	2/8/2012	Jurisdiction	City of Ukiah/Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing

Project Description: Costco Environmental Impact Report

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1279	veh/h	Peak-Hour Factor, PHF	0.95	
AADT		veh/day	%Trucks and Buses, P_T	8	
Peak-Hr Prop. of AADT, K			%RVs, P_R	3	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2	
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.956	

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.87	ramps/mi	TRD Adjustment	5.4	mph
FFS (measured)		mph	FFS	70.0	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	704	pc/h/ln	Design LOS		
S	70.0	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
D = v_p / S	10.1	pc/mi/ln	S		mph
LOS	A		D = v_p / S		pc/mi/ln
			Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	CH	Highway/Direction of Travel	US 101 Southbound
Agency or Company	W-Trans	From/To	Talmage Rd to E Gobbi St
Date Performed	2/8/2012	Jurisdiction	City of Ukiah/Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing

Project Description: Costco Environmental Impact Report

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1266	veh/h	Peak-Hour Factor, PHF	0.95	
AADT		veh/day	%Trucks and Buses, P_T	8	
Peak-Hr Prop. of AADT, K			%RVs, P_R	3	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2	
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.956	

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.87	ramps/mi	TRD Adjustment	5.4	mph
FFS (measured)		mph	FFS	70.0	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	697	pc/h/ln	Design LOS		
S	70.0	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
D = v_p / S	10.0	pc/mi/ln	S		mph
LOS	A		D = v_p / S		pc/mi/ln
			Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	CH	Highway/Direction of Travel	US 101 Northbound
Agency or Company	W-Trans	From/To	South State St to Talmage Rd
Date Performed	2/8/2012	Jurisdiction	City of Ukiah/Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing + Project

Project Description: Costco Environmental Impact Report

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	702	veh/h	Peak-Hour Factor, PHF	0.95
AADT		veh/day	%Trucks and Buses, P_T	8
Peak-Hr Prop. of AADT, K			%RVs, P_R	3
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi

Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.956

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	0.73	ramps/mi	TRD Adjustment	2.5	mph
FFS (measured)		mph	FFS	72.9	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	386	pc/h/ln	Design LOS		
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S	75.0	mph	S		mph
D = v_p / S	5.1	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	A		Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	CH	Highway/Direction of Travel	US 101 Southbound
Agency or Company	W-Trans	From/To	South State St to Talmage Rd
Date Performed	2/8/2012	Jurisdiction	City of Ukiah/Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing + Project

Project Description: Costco Environmental Impact Report

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	696	veh/h	Peak-Hour Factor, PHF	0.95
AADT		veh/day	%Trucks and Buses, P_T	8
Peak-Hr Prop. of AADT, K			%RVs, P_R	3
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi

Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.956

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	0.73	ramps/mi	TRD Adjustment	2.5	mph
FFS (measured)		mph	FFS	72.9	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	383	pc/h/ln	Design LOS		
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S	75.0	mph	S		mph
D = v_p / S	5.1	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	A		Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	CH	Highway/Direction of Travel	US 101 Northbound
Agency or Company	W-Trans	From/To	Talmage Rd to E Gobbi St
Date Performed	2/8/2012	Jurisdiction	City of Ukiah/Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing + Project

Project Description: Costco Environmental Impact Report

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1394	veh/h	Peak-Hour Factor, PHF	0.95	
AADT		veh/day	%Trucks and Buses, P_T	8	
Peak-Hr Prop. of AADT, K			%RVs, P_R	3	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2	
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.956	

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.87	ramps/mi	TRD Adjustment	5.4	mph
FFS (measured)		mph	FFS	70.0	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	767	pc/h/ln	Design LOS		
S	70.0	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
D = v_p / S	11.0	pc/mi/ln	S		mph
LOS	A		D = v_p / S		pc/mi/ln
			Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	CH	Highway/Direction of Travel	US 101 Southbound
Agency or Company	W-Trans	From/To	Talmage Rd to E Gobbi St
Date Performed	2/8/2012	Jurisdiction	City of Ukiah/Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Existing + Project

Project Description: Costco Environmental Impact Report

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1377	veh/h	Peak-Hour Factor, PHF	0.95	
AADT		veh/day	%Trucks and Buses, P_T	8	
Peak-Hr Prop. of AADT, K			%RVs, P_R	3	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2	
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.956	

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	1.87	ramps/mi	TRD Adjustment	5.4	mph
FFS (measured)		mph	FFS	70.0	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	758	pc/h/ln	Design LOS		
S	70.0	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
D = v_p / S	10.8	pc/mi/ln	S		mph
LOS	A		D = v_p / S		pc/mi/ln
			Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	CH	Highway/Direction of Travel	US 101 Northbound
Agency or Company	W-Trans	From/To	South State St to Talmage Rd
Date Performed	2/8/2012	Jurisdiction	City of Ukiah/Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Baseline

Project Description: Costco Environmental Impact Report

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs					
Volume, V	691	veh/h	Peak-Hour Factor, PHF	0.95	
AADT		veh/day	%Trucks and Buses, P_T	8	
Peak-Hr Prop. of AADT, K			%RVs, P_R	3	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length	mi	
			Up/Down %		

Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.956

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	0.73	ramps/mi	TRD Adjustment	2.5	mph
FFS (measured)		mph	FFS	72.9	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	380	pc/h/ln	Design LOS		
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S	75.0	mph	S		mph
D = v_p / S	5.1	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	A		Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	CH	Highway/Direction of Travel	US 101 Southbound
Agency or Company	W-Trans	From/To	South State St to Talmage Rd
Date Performed	2/8/2012	Jurisdiction	City of Ukiah/Caltrans
Analysis Time Period	PM Peak Hour	Analysis Year	Baseline

Project Description: Costco Environmental Impact Report

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs					
Volume, V	682	veh/h	Peak-Hour Factor, PHF	0.95	
AADT		veh/day	%Trucks and Buses, P_T	8	
Peak-Hr Prop. of AADT, K			%RVs, P_R	3	
Peak-Hr Direction Prop, D			General Terrain:	Level	
DDHV = AADT x K x D		veh/h	Grade % Length	mi	
			Up/Down %		

Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.956

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	0.73	ramps/mi	TRD Adjustment	2.5	mph
FFS (measured)		mph	FFS	72.9	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	375	pc/h/ln	Design LOS		
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S	75.0	mph	S		mph
D = v_p / S	5.0	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	A		Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CH*	Highway/Direction of Travel	*US 101 Northbound*
Agency or Company	*W-Trans*	From/To	*Talmage Rd to E Gobbi St*
Date Performed	*2/8/2012*	Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Baseline*

Project Description *Costco Environmental Impact Report*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1304*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*8*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*	
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*	

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft			
Rt-Side Lat. Clearance	*6.0*	ft	f_{LW}	*0.0*	mph
Number of Lanes, N	*2*		f_{LC}	*0.0*	mph
Total Ramp Density, TRD	*1.87*	ramps/mi	TRD Adjustment	*5.4*	mph
FFS (measured)		mph	FFS	*70.0*	mph
Base free-flow Speed, BFFS	*75.4*	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*718*	pc/h/ln	Design LOS		
S	*70.0*	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
D = v_p / S	*10.3*	pc/mi/ln	S		mph
LOS	*A*		D = v_p / S		pc/mi/ln
			Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*CH*	Highway/Direction of Travel	*US 101 Southbound*
Agency or Company	*W-Trans*	From/To	*Talmage Rd to E Gobbi St*
Date Performed	*2/8/2012*	Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Baseline*

Project Description *Costco Environmental Impact Report*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1301*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*8*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

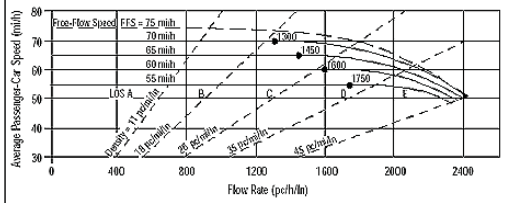
f_p	*1.00*	E_R	*1.2*	
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*	

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft			
Rt-Side Lat. Clearance	*6.0*	ft	f_{LW}	*0.0*	mph
Number of Lanes, N	*2*		f_{LC}	*0.0*	mph
Total Ramp Density, TRD	*1.87*	ramps/mi	TRD Adjustment	*5.4*	mph
FFS (measured)		mph	FFS	*70.0*	mph
Base free-flow Speed, BFFS	*75.4*	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*716*	pc/h/ln	Design LOS		
S	*70.0*	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
D = v_p / S	*10.2*	pc/mi/ln	S		mph
LOS	*A*		D = v_p / S		pc/mi/ln
			Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Northbound*
Agency or Company	*W-Trans*		From/To	*South State St to Talmage Rd*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Baseline + Project*
Project Description	Costco Environmental Impact Report			

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*719*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*0.73*	l/mi	f_{ID}	*1.2*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*64.3*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*396*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*64.3*	mi/h	S		mi/h
D = v_p / S	*6.2*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*A*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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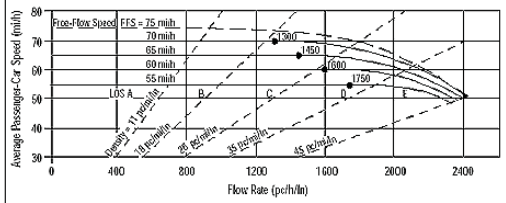
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Southbound*
Agency or Company	*W-Trans*		From/To	*South State St to Talmage Rd*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Baseline + Project*
Project Description	Costco Environmental Impact Report			

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*711*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*0.73*	l/mi	f_{ID}	*1.2*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*64.3*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*391*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*64.3*	mi/h	S		mi/h
D = v_p / S	*6.1*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*A*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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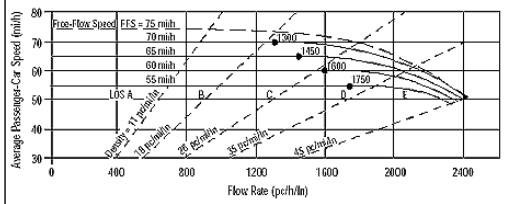
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Northbound*
Agency or Company	*W-Trans*		From/To	*Talmage Rd to E Gobbi St*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Baseline + Project*
Project Description	Costco Environmental Impact Report			

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*1426*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.87*	l/mi	f_{ID}	*6.9*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*58.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*785*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*58.6*	mi/h	S		mi/h
D = v_p / S	*13.4*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*B*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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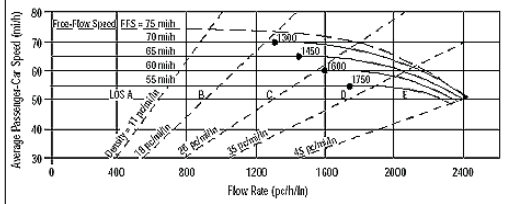
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Southbound*
Agency or Company	*W-Trans*		From/To	*Talmage Rd to E Gobbi St*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Baseline + Project*
Project Description	Costco Environmental Impact Report			

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*1417*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*1.00*		Up/Down %	

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.87*	l/mi	f_{ID}	*6.9*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*58.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*780*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*58.6*	mi/h	S		mi/h
D = v_p / S	*13.3*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*B*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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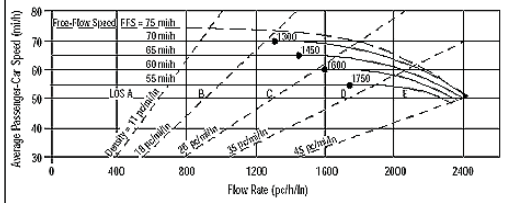
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Northbound*
Agency or Company	*W-Trans*		From/To	*South State St to Talmage Rd*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Fut Current RBP*
Project Description	Costco Environmental Impact Report			
☑ Oper.(LOS)	☐ Des.(N)	☐ Planning Data		

Flow Inputs					
Volume, V	*982*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*8*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*	
Driver type adjustment	*1.00*		Up/Down %		

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*0.73*	l/mi	f_{ID}	*1.2*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*64.3*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*541*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*64.3*	mi/h	S		mi/h
D = v_p / S	*8.4*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*A*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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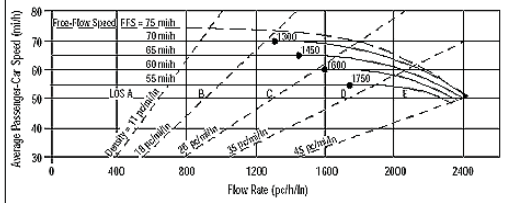
BASIC FREEWAY WORKSHEET Page 1 of 1

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH1*		Highway/Direction of Travel	*US 101 Southbound*
Agency or Company	*W-Trans*		From/To	*South State St to Talmage Rd*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Fut Current RBP*
Project Description	Costco Environmental Impact Report			
☑ Oper.(LOS)	☐ Des.(N)	☐ Planning Data		

Flow Inputs					
Volume, V	*1119*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*8*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*	
Driver type adjustment	*1.00*		Up/Down %		

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*0.73*	l/mi	f_{ID}	*1.2*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*64.3*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*616*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*64.3*	mi/h	S		mi/h
D = v_p / S	*9.6*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*A*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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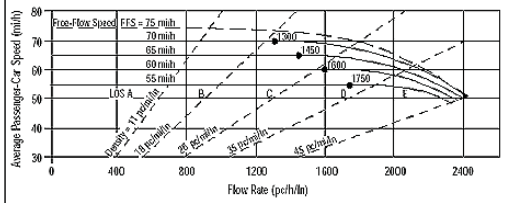
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Northbound*
Agency or Company	*W-Trans*		From/To	*Talmage Rd to E Gobbi St*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Fut Current RBP*
Project Description	Costco Environmental Impact Report			
☑ Oper.(LOS)	☐ Des.(N)	☐ Planning Data		

Flow Inputs					
Volume, V	*1264*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*8*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*	
Driver type adjustment	*1.00*		Up/Down %		

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.87*	l/mi	f_{ID}	*6.9*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*58.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*696*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*58.6*	mi/h	S		mi/h
D = v_p / S	*11.9*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*B*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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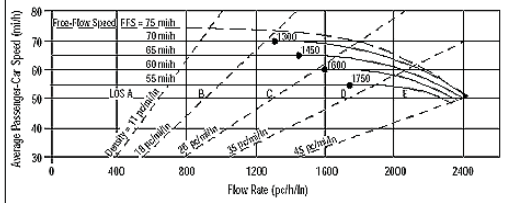
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Southbound*
Agency or Company	*W-Trans*		From/To	*Talmage Rd to E Gobbi St*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Fut Current RBP*
Project Description	Costco Environmental Impact Report			
☑ Oper.(LOS)	☐ Des.(N)	☐ Planning Data		

Flow Inputs					
Volume, V	*1724*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*8*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*	
Driver type adjustment	*1.00*		Up/Down %		

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.87*	l/mi	f_{ID}	*6.9*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*58.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*949*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*58.6*	mi/h	S		mi/h
D = v_p / S	*16.2*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*B*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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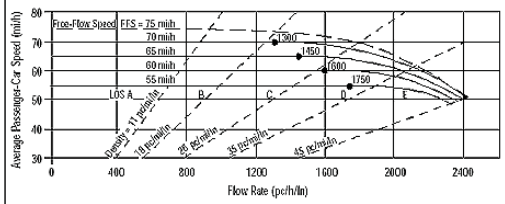

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Northbound*
Agency or Company	*W-Trans*		From/To	*South State St to Talmage Rd*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Fut Current RBP + Proj*
Project Description	Costco Environmental Impact Report			
☑ Oper.(LOS)	☐ Des.(N)	☐ Planning Data		

Flow Inputs					
Volume, V	*1009*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*8*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*	
Driver type adjustment	*1.00*		Up/Down %		

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*0.73*	l/mi	f_{ID}	*1.2*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*64.3*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*555*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*64.3*	mi/h	S		mi/h
D = v_p / S	*8.6*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*A*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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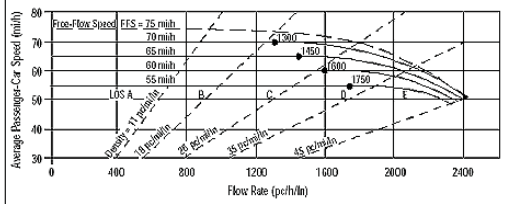
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Southbound*
Agency or Company	*W-Trans*		From/To	*South State St to Talmage Rd*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Fut Current RBP + Proj*
Project Description	Costco Environmental Impact Report			
☑ Oper.(LOS)	☐ Des.(N)	☐ Planning Data		

Flow Inputs					
Volume, V	*1148*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*8*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*	
Driver type adjustment	*1.00*		Up/Down %		

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*0.73*	l/mi	f_{ID}	*1.2*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*64.3*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*632*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*64.3*	mi/h	S		mi/h
D = v_p / S	*9.8*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*A*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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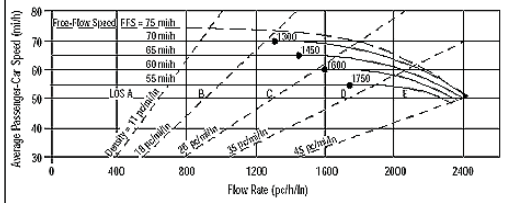
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Northbound*
Agency or Company	*W-Trans*		From/To	*Talmage Rd to E Gobbi St*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Fut Current RBP + Proj*
Project Description	Costco Environmental Impact Report			
☑ Oper.(LOS)	☐ Des.(N)	☐ Planning Data		

Flow Inputs					
Volume, V	*1386*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*8*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*	
Driver type adjustment	*1.00*		Up/Down %		

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.87*	l/mi	f_{ID}	*6.9*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*58.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*763*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*58.6*	mi/h	S		mi/h
D = v_p / S	*13.0*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*B*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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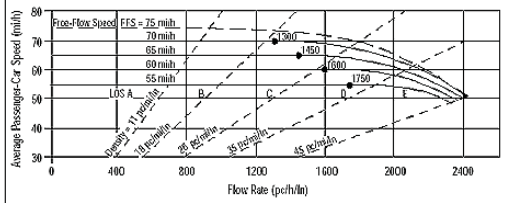
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information			***Site Information***	
Analyst	*TDH*		Highway/Direction of Travel	*US 101 Southbound*
Agency or Company	*W-Trans*		From/To	*Talmage Rd to E Gobbi St*
Date Performed	*6/25/2012*		Jurisdiction	*City of Ukiah/Caltrans*
Analysis Time Period	*PM Peak Hour*		Analysis Year	*Fut Current RBP + Proj*
Project Description	Costco Environmental Impact Report			
☑ Oper.(LOS)	☐ Des.(N)	☐ Planning Data		

Flow Inputs					
Volume, V	*1841*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*8*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*3*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*	
Driver type adjustment	*1.00*		Up/Down %		

Calculate Flow Adjustments			
f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.956*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.87*	l/mi	f_{ID}	*6.9*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*58.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1014*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*58.6*	mi/h	S		mi/h
D = v_p / S	*17.3*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*B*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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Appendix D

Costco Trip Generation Surveys

Summary of Representative Sites for Ukiah

Turlock, CA (note includes Party City) 136.778 1,000 sq-ft
12 fueling positions

PM Peak Hour

	In	Out	Total
N Tegner Rd - Middle Costco Dwy	36	39	75
N Tegner Rd - Costco Receiving Dwy	51	55	106
Internal Dwy between Party City and Costco - Internal Costco Dwy	49	9	58
Main Driveway - Powers Court	321	350	671
Total	**457**	**453**	**910**

Turlock, CA (note includes Party City)

SATURDAY PEAK HOUR

	In	Out	Total
N Tegner Rd - Middle Costco Dwy	56	39	95
N Tegner Rd - Costco Receiving Dwy	55	54	109
Internal Dwy between Party City and Costco - Internal Costco Dwy	21	12	33
Main Driveway - Powers Court	400	418	818
Total	**532**	**523**	**1055**

Eureka, CA 121.202 1,000 sq-ft
12 fueling positions

PM Peak Hour

	In	Out	Total
Short St - South Costco Dwy	92	238	330
Short St - North Costco Dwy	174	175	349
Costco Gas Dwy - W Wabash Ave	125	9	134
Costco Receiving - Wabash Ave	4	3	7
Railroad Ave - Costco Dwy	29	28	57
Total	**424**	**453**	**877**

Eureka, CA

SATURDAY PEAK HOUR

	In	Out	Total
Short St - South Costco Dwy	113	265	378
Short St - North Costco Dwy	185	183	368
Costco Gas Dwy - W Wabash Ave	138	6	144
Costco Receiving - Wabash Ave	0	6	6
Railroad Ave - Costco Dwy	38	30	68
Total	**474**	**490**	**964**

Carson City, NV 148.663 1,000 sq-ft
12 fueling positions

PM Peak Hour

	In	Out	Total
Costco East Dwy - Old Clearwater Creek Rd	305	428	733
Costco Gas Dwy - Old Clear Creek Rd	156	59	215
Total	**461**	**487**	**948**

Carson City, NV

SATURDAY PEAK HOUR

	In	Out	Total
Costco East Dwy - Old Clearwater Creek Rd	350	406	756
Costco Gas Dwy - Old Clear Creek Rd	184	75	259
Total	**534**	**481**	**1015**

Average

	In	Out	Total
Weekday PM Peak Hour	**447**	**464**	**912**
Saturday Midday Peak Hour	**513**	**498**	**1011**

Costco (Warehouse + Fuel Station Sites) Trip Type Information

								PM Peak Hour of Adjacent			Saturday Peak Hour of Generator/Adjacent		
Country	State/ Province	County	City	Store Size (SF)	Store Type	Fuel Station (Y/N)?	Number of Fueling Positions?	PM Primary	PM Pass-by	PM Diverted	Saturday Peak Primary	Saturday Peak Pass-by	Saturday Peak Diverted
USA	MT	Lewis & Clark	Helena	146,217	Warehouse	Y	12	17%	34%	49%			
USA	MT	Missoula	Missoula	122,528	Warehouse	Y	12	21%	47%	32%	26%	39%	35%
USA	OR	Linn	Albany	148,161	Warehouse	Y	12	23%	25%	52%			
USA	CA	San Diego	Morena	161,674	Warehouse	Y	16	66%	11%	23%			
USA	CA	Orange	Laguna Niguel	149,705	Warehouse	Y	12	52%	31%	16%	53%	24%	23%
USA	CA	Santa Clara		135,444	Warehouse	Y	12	42%	10%	48%	75%	16%	9%
USA	OR	Jackson	Medford	136,144	Warehouse	Y	12	59%	17%	25%			
USA	OR	Lane	Eugene	140,700	Warehouse	Y	16	34%	20%	46%			
USA	NY	Richmond	Staten Island	121,216	Warehouse	Y	12	25%	67%	8%	49%	49%	2%
USA	CA	Solano	Vallejo	125,434	Warehouse	Y	16	29%	54%	18%	58%	37%	5%
USA	VA	West Henrico		126,976	Warehouse	Y	12	9%	42%	49%	50%	27%	24%
USA	CO	Arapahoe	Aurora	133,711	Warehouse	Y	12	22%	44%	33%	43%	37%	19%
USA	FL	Seminole	Altamonte Springs	135,229	Warehouse	Y	12	32%	42%	26%			
USA	CA	Ventura	Simi Valley	136,296	Warehouse	Y	12	35%	60%	5%	75%	17%	8%
USA	WA	Spokane	Spokane	156,987	Warehouse	Y	16	35%	29%	37%	44%	27%	29%
USA	WA	Clark	Vancouver	155,465	Warehouse	Y	16	22%	52%	26%	29%	35%	36%
							AVERAGE	**33%**	**37%**	**31%**	**50%**	**31%**	**19%**