

# Traffic Impact Study for Scotts Valley Townhomes



Prepared for the  
City of Scotts Valley



Submitted by

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## Introduction

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### Introduction

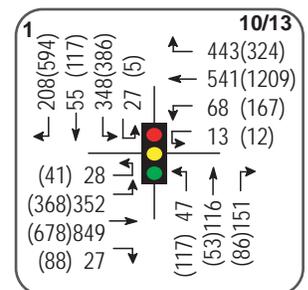
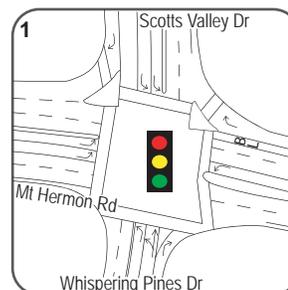
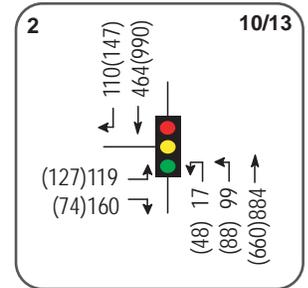
This report presents an analysis of the potential traffic impacts that would be associated with development of the proposed Scotts Valley Townhomes, a townhome development with up to 24 units, to be located along Scotts Valley Drive with access just north of Bean Creek Road in the City of Scotts Valley. The traffic study was completed in accordance with the criteria established by the City of Scotts Valley, and is consistent with standard traffic engineering techniques.

### Prelude

The purpose of a traffic impact study is to provide Scotts Valley staff and policy makers with data that they can use to make an informed decision regarding the potential traffic impacts of a proposed project, and any associated improvements that would be required in order to mitigate these impacts to a level of insignificance as defined by the City of Scotts Valley General Plan or other policies. Vehicular traffic impacts are typically evaluated by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on existing travel patterns or anticipated travel patterns specific to the proposed project, then analyzing the impact the new traffic would be expected to have on critical intersections or roadway segments. Impacts relative to safety, including for pedestrians and bicyclists, and to transit are also addressed.

### Project Profile

The proposed project includes development of up to 24 townhomes on a currently vacant site on the east side of Scotts Valley Drive. Access is proposed just north of Bean Creek Road. Three plans providing connections to this access were evaluated. The project site is shown in Figure I.



## Transportation Setting

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### Operational Analysis

#### Study Area and Periods

The study area consists of the following intersections:

1. Scotts Valley Drive-Whispering Pines Drive/Mount Hermon Road
2. Scotts Valley Drive/Bean Creek Road

In addition, U-turn movements at the intersection of Scotts Valley/Quien Sabe Road were assessed.

Operating conditions during the a.m. and p.m. peak periods were evaluated to capture the highest potential impacts for the proposed project as well as the highest volumes on the local transportation network. The morning peak hour occurs between 7:00 and 9:00 a.m. and reflects conditions during the home to work or school commute, while the p.m. peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion during the homeward bound commute.

#### Study Area

*Scotts Valley Drive-Whispering Pines Drive/Mount Hermon Road* is a signalized four-way intersection with protected left-turn phasing on Mount Hermon Road and split phasing on Scotts Valley Drive-Whispering Pines Drive. Crosswalks equipped with pedestrian signal heads are available on all four legs of the intersection.

*Scotts Valley Drive/Bean Creek Road* is a signalized tee-intersection with protected left-turn phasing on Scotts Valley Drive. School crosswalks equipped with pedestrian signals are present on all legs of the intersection.

The locations of the study intersections and the existing lane configurations and controls are shown in Figure 1.

#### Study Roadway

*Scotts Valley Drive* is a four-lane north-south arterial with bike lanes, a center median, and left-turn lanes at side-street intersections.

### 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 records available from the California Highway Patrol as published in their *Statewide Integrated Traffic Records System (SWITRS)* reports. The most current five-year period available is March 2007 through February 2012.

As presented in Table 1, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2009 Collision Data on California State Highways*, California Department of Transportation (Caltrans). The calculated collision rate is slightly, but not significantly higher than the statewide averages at Scotts Valley Drive/Bean Creek Road, and lower at Scotts Valley Drive-Whispering Pines Drive/Mount Hermon Road.

**Table I**  
**Collision Rates at the Study Intersections**

<b>Study Intersection</b>	<b>Number of Collisions (2007-2012)</b>	<b>Calculated Collision Rate (c/mve)</b>	<b>Statewide Average Collision Rate (c/mve)</b>
1. Scotts Valley Dr-Whispering Pines Dr/ Mt. Hermon Rd	27	0.35	0.36
2. Scotts Valley Dr/Bean Creek Rd	11	0.28	0.25

Note: c/mve = collisions per million vehicles entering

Trends were found in the collision history at both study intersections. At Scotts Valley Drive-Whispering Pines Drive/Mount Hermon Road, rear-end collisions occurred more frequently than other collisions, with the majority of rear-end collisions involving vehicles travelling eastbound. This type of collision is typically congestion related. In addition, there was a high frequency of collisions involving southbound traffic at Scotts Valley Drive/Bean Creek Road. A majority of reported collisions were rear-end collisions involving southbound traffic and broadside collisions involving southbound through traffic and left turns from other approaches.

### **Alternative Modes**

#### Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site.

- *Scotts Valley Drive-Whispering Pines Drive* – Continuous sidewalk coverage is provided on Scotts Valley Drive on both sides of the street. Sidewalks are provided along developed property frontages. Curb ramps and crosswalks at side street approaches exist. Lighting is provided by overhead street lights at signalized intersections and is available elsewhere intermittently.
- *Mount Hermon Road* – Continuous sidewalk coverage is provided on both sides of Mount Hermon Road. Lighting is provided by overhead street lights at signalized intersections and is available elsewhere intermittently.

#### Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2012, classifies bikeways into three categories:

- *Class I Multi-Use Path*: a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- *Class II Bike Lane*: a striped and signed lane for one-way bike travel on a street or highway.
- *Class III Bike Route*: signing only for shared use with motor vehicles within the same travel lane on a street or highway.

In the project area, Class II bike lanes exist on Scotts Valley Drive and Whispering Pines Drive between Vine Hill School Road and Estrella Drive, Mount Hermon Road between Skypark Drive-Lockwood Lane and La Madrona Drive-SR 17, and Bean Creek Road between Scotts Valley Drive and Bluebonnet Lane. Table 2 summarizes the existing bicycle facilities in the project vicinity, as contained in the *City of Scotts Valley Bicycle Transportation Plan*.

**Table 2  
Existing Bicycle Facilities**

<b>Facility</b>	<b>Class</b>	<b>Length (miles)</b>	<b>Begin Point</b>	<b>End Point</b>
Scotts Valley Dr- Whispering Pines Dr	II	2.8	Vine Hill School Rd	Estrella Dr
Mt. Hermon Rd	II	1.1	Skypark Dr-Lockwood Ln	La Madrona Dr-SR 17
Bean Creek Rd	II	0.4	Bluebonnet Ln	Scotts Valley Dr

Source: *City of Scotts Valley Bicycle Transportation Plan*, Majid Yamin and Kimarie Jones, 2012

Transit Facilities

The Santa Cruz Metro provides fixed route bus service in the City of Scotts Valley. Santa Cruz Metro Routes 35 and 35A provide local service between Scotts Valley and Downtown Santa Cruz. The nearest bus stops for Routes 35 and 35A are located at Scotts Valley Drive/Bean Creek Road, which serve most trips from Santa Cruz. Other nearby bus stops serving all Route 35 and 35A trips are located approximately one-quarter mile away on Mount Hermon Road near Spring Lakes Drive. Each route operates daily between 7:30 a.m. and 11:00 a.m. with approximately 30-minute headways.

Santa Cruz Metro Route 17 provides regional service to Santa Cruz to the south and San Jose to the north, with the nearest bus stops located on Mount Hermon Road near Springs Lakes Drive. Route 17 operates Monday through Friday between 6:30 a.m. and 9:00 p.m. with approximately 20-minute headways during commute hours and longer headways of one to two hours outside of commute hours. Weekend service is provided between 8:00 a.m. and 10:00 p.m. with eight trips per weekend serving Scotts Valley.

All Santa Cruz Metro buses are equipped with bike racks that can accommodate up to three bicycles. Bike rack space is on a first come, first served basis. All Santa Cruz Metro buses are able to accommodate passengers with disabilities, and are equipped with ramps or lifts to accommodate passengers who use a mobility device or have difficulty climbing stairs.

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 temporary or permanent physical, cognitive, or psychiatric disability. ParaCruz, a paratransit service operated by Santa Cruz Metro, is designed to serve the needs of individuals with disabilities in Santa Cruz County within three quarter miles of an operating bus route and the greater Scotts Valley area.

## Analysis Methodology

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### Intersection 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 the signalized methodology published in the *Highway Capacity Manual (HCM)*, Transportation Research Board, 2010. 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 signalized 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. For purposes of this study, delays were calculated using optimized signal timing.

The ranges of delay associated with the various levels of service are indicated in Table 3.

**Table 3**  
**Signalized Intersection Level of Service Criteria**

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LOS A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
LOS B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
LOS C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
LOS D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
LOS E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
LOS F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

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Reference: *Highway Capacity Manual*, Transportation Research Board, 2010

### Traffic Operation Standards

The Circulation Element of the *Scotts Valley General Plan* states that the Level of Service standard for the intersection of Scotts Valley Drive-Whispering Pines Drive/Mount Hermon Road is LOS D, while a minimum of LOS C is accepted for all other intersections within the City of Scotts Valley.

## Project Traffic

### Project Description

The project consists of the development of up to 24 townhomes with access on Scotts Valley Drive. The proposed project site plan is shown in Figure 2.

Three access plan alternatives were evaluated:

- *Access Plan 1 – Proposed Access Improvements:* This is the proposed access plan which includes a right-turn out only connection on Scotts Valley Drive, approximately 50 feet north of Bean Creek Road. This access configuration will require outbound trips destined to southbound Scotts Valley Drive to complete a U-turn at Quien Sabe Road. Access improvements would be made to Scotts Valley Drive/Bean Creek Road to create a left-turn lane into the project, site, allowing inbound trips from southbound Scotts Valley Drive to turn left at Bean Creek Road while under traffic signal control.
- *Access Plan 2 – Existing Access Conditions:* This access plan assumes no changes to the existing roadway configuration on Scotts Valley Drive. Outbound trips will be required to make a right and could make use of a legal U-turn at Quien Sabe Road. Inbound trips must access the site using northbound Scotts Valley Drive, with trips from the north entering via a southbound U-turn at Scotts Valley Drive/Mount Hermon Road. Southbound left turn and U-turn restrictions would remain at Bean Creek Road but a legal U-turn could be made at Scotts Valley Drive and Mt. Hermon Road.
- *Access Plan 3 – Bean Creek Alignment Plan:* This access plan would align the site access with Bean Creek Road. This would reconfigure Scotts Valley Drive/Bean Creek Road into a signalized four-way intersection with access to the project on the east leg of the intersection. This access alternative would require a re-design of project site to align the site access to Bean Creek Road.

### The three access plans are shown in Figure 3. Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 9<sup>th</sup> Edition, 2012, for the “Residential Condominium/Townhouse” land use (ITE LU #230). The expected trip generation potential for the proposed project is indicated in Table 4, and includes an average of 139 trips per day, with 11 trips during the a.m. peak hour and 12 during the p.m. peak hour.

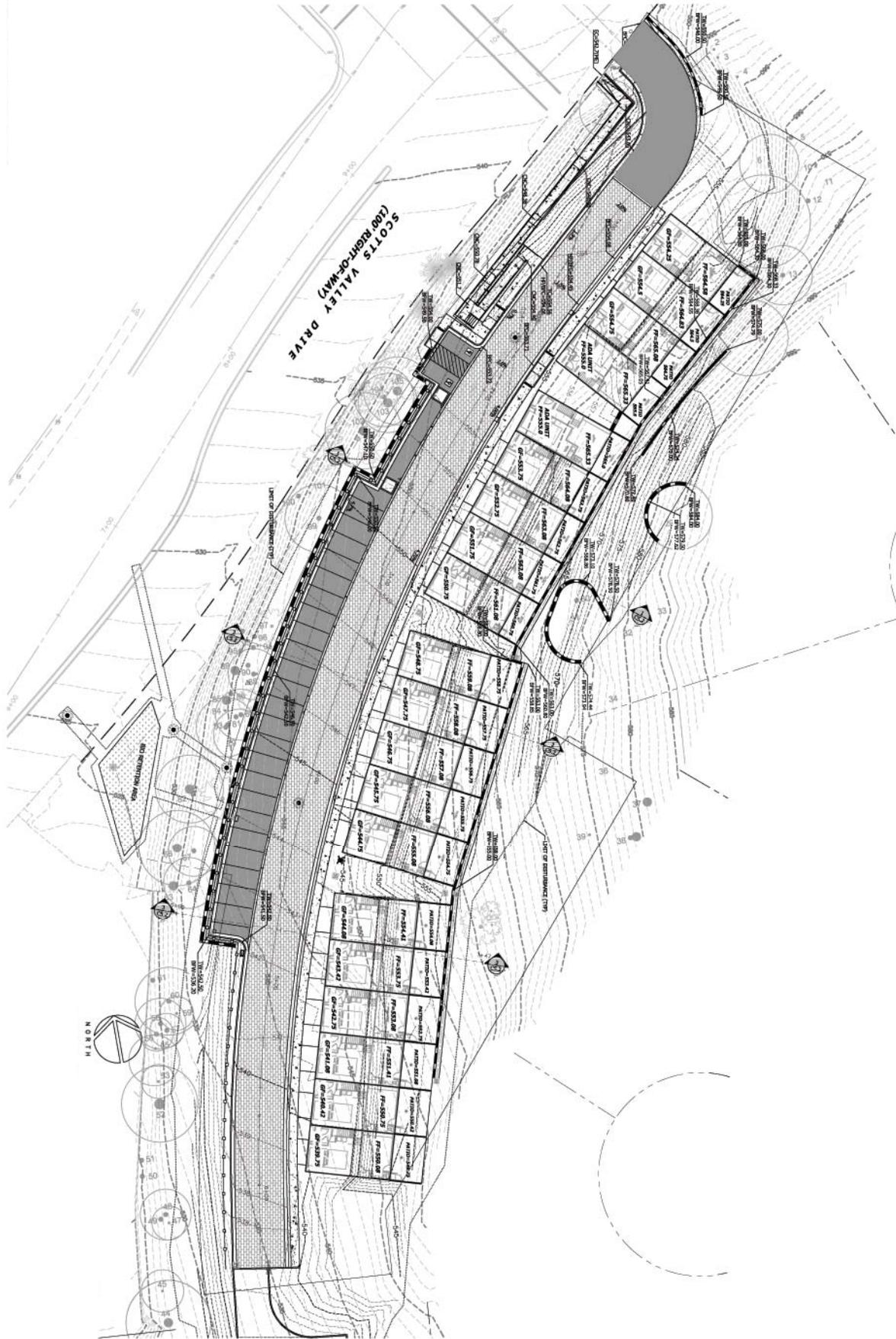
**Table 4**  
**Trip Generation Summary**

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Townhouse	24 du	5.81	139	0.44	11	2	9	0.52	12	8	4

Note: du = dwelling unit

### Trip Distribution

The pattern used to allocate new project trips to the street network was based on traffic count data as well as an understanding of the street network. The applied distribution assumptions and resulting trips are shown in Table 5.



Source: C2G/Civil Consultants Group, Inc 9/14

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Scotts Valley Townhomes Traffic Impact Study  
**Figure 2 – Site Plan**





OF 1 SHEET <b>C1</b>	DATE: 03.03.13 SCALE: AS SHOWN DRAWN: DD JOB: 248-50	<b>THE TERRACE AT SCOTT'S VALLEY</b> SCOTT'S VALLEY, CA APN: 022-162-69	<b>C2C</b> CIVIL CONSULTANTS GROUP, INC. Engineers/Planners 4444 Scotts Valley Drive / Suite 6 Scotts Valley, CA 95460 T (925) 438-4420 F (925) 438-4420	<b>OFFSITE IMPROVEMENTS EXHIBIT</b>	RECORDS NO. _____ DATE _____
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Scotts Valley Townhomes Traffic Impact Study  
**Figure 3 – Access Plans**



**Table 5  
Trip Distribution Assumptions**

<b>Route</b>	<b>Percent</b>	<b>Daily Trips</b>	<b>AM Trips</b>	<b>PM Trips</b>
Scotts Valley Dr – North	40%	55	5	5
Mount Hermon Rd – West	30%	42	3	4
Mount Hermon Rd – East	30%	42	3	3
<b>TOTAL</b>	<b>100%</b>	<b>139</b>	<b>11</b>	<b>12</b>

**Site Access**

At the request of the City, three Access Plans were considered for the project. All three Access Plans would result in site access along Scotts Valley Drive. Under Access Plans 1 and 2, the project would be accessed by a driveway on Scotts Valley Drive to be located approximately 50 feet north of the intersection with Bean Creek Road. There is an existing driveway curb-cut at this location. Under Access Plan 3, the site would be accessed by a new east leg of Scotts Valley Drive/Bean Creek Road.

Access Plan 1 – Proposed Access Improvements

Under conditions with the proposed access improvements, the median island on Scotts Valley Drive would be modified to allow for left-turns directly into the project driveway. The start of the left-most lane near Quien Sabe Road would be eliminated by expanding the existing median through cross-hatch striping in order to make the lane function as a turn pocket lane. Appropriate signing and striping modifications would be provided to alert drivers of the change in lane configurations on the southbound approach to Bean Creek Road. The lane would additionally be designed to allow for at least 100 feet of queuing plus a minimum 60 foot transition. Vehicles making the left-turn into the project site would be controlled with protected left-turn phasing from the signal at Scotts Valley Drive/Bean Creek Road. The change would result in two southbound through lanes on Scotts Valley Drive at Bean Creek Road, as compared to the three existing southbound through lanes. The planned access improvements would continue to prohibit left-turns out of the driveway. Trips normally requiring left-turns out of the driveway would instead require a U-turn movement at Quien Sabe Road, where northbound U-turns are permitted.

*Finding:* The access improvements proposed in Access Plan 1 would result in adequate access to the project site.

Access Plan 2 – Existing Access Conditions

Access Plan 2 would result in no modifications to existing roadway configurations on Scotts Valley Drive. Trips normally requiring left-turns into the driveway would instead require a U-turn movement at Mount Hermon Road, where southbound U-turns are permitted. Trips normally requiring left-turns out of the driveway would instead require a U-turn movement at Quien Sabe Road, as is required in Access Plan 1.

*Finding:* The access improvements proposed in Access Plan 2 would result in adequate access to the project site.

Access Plan 3 – Bean Creek Alignment Plan

Access Plan 3 would require redesign of the project in order to re-align site access on Scotts Valley Drive to Bean Creek Road. Similar to Access Plan 1, the start of the left-most lane near Quien Sabe Road would be eliminated by expanding the existing median through cross-hatch striping in order to make the lane

function as a turn pocket lane. The intersection of Scotts Valley Drive/Bean Creek Road would require reconfiguration to add the east project-access leg, and would require implementation of protected left-turn phasing on the southbound Scotts Valley Drive approach. However, with the topographic constraints east of Scotts Valley Drive/Bean Creek Road, this alternative would require significant grade modifications on-site.

*Finding:* The access improvements proposed in Access Plan 3 would result in adequate access to the project site. However, significant changes to the project site design would be required.

## **Alternative Modes**

### Pedestrian Facilities

Given the proximity of schools and strip commercial development surrounding the site, it is reasonable to assume that some project patrons and employees will want to walk, bicycle, and/or utilize transit to reach the project site.

*Project Site* – Sidewalks exist along the project frontage. No pedestrian paths are provided within the project site.

*Finding:* On-street pedestrian facilities serving the project site are adequate. However, there is a lack of pedestrian facilities connecting the townhomes to on-street sidewalks on Scotts Valley Drive.

*Recommendation:* Sidewalks should be provided from the project frontage on Scotts Valley Drive to the townhomes to improve pedestrian travel to and from the project.

### Bicycle Facilities

Existing bicycle facilities, including bike lanes on Scotts Valley Drive, Mount Hermon Road, Whispering Pines Drive, and Bean Creek Road, together with shared use of minor streets provide adequate access for bicyclists.

*Finding:* Bicycle facilities serving the project site are adequate.

### Transit

Existing transit routes are adequate to accommodate project-generated transit trips. Existing stops are within acceptable walking distance of the site.

*Finding:* Transit facilities serving the project site are adequate.

## Intersection Capacity Analysis

### Existing Condition

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. Volume data was collected in October 2013, while local schools were in session.

Under existing conditions, both of the study intersections are operating acceptably. The existing traffic volumes are shown in Figure 4. A summary of the intersection level of service calculations is contained in Table 6, and copies of the Level of Service calculations are provided in Appendix A.

**Table 6  
Existing Peak Hour Intersection Levels of Service**

Study Intersection	Existing Conditions			
	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
1. Scotts Valley Dr-Whispering Pines Dr/Mt. Hermon Rd	37.2	D	43.7	D
2. Scotts Valley Dr/Bean Creek Rd	16.7	B	14.2	B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

### Intersection Operation

#### Existing plus Project Conditions

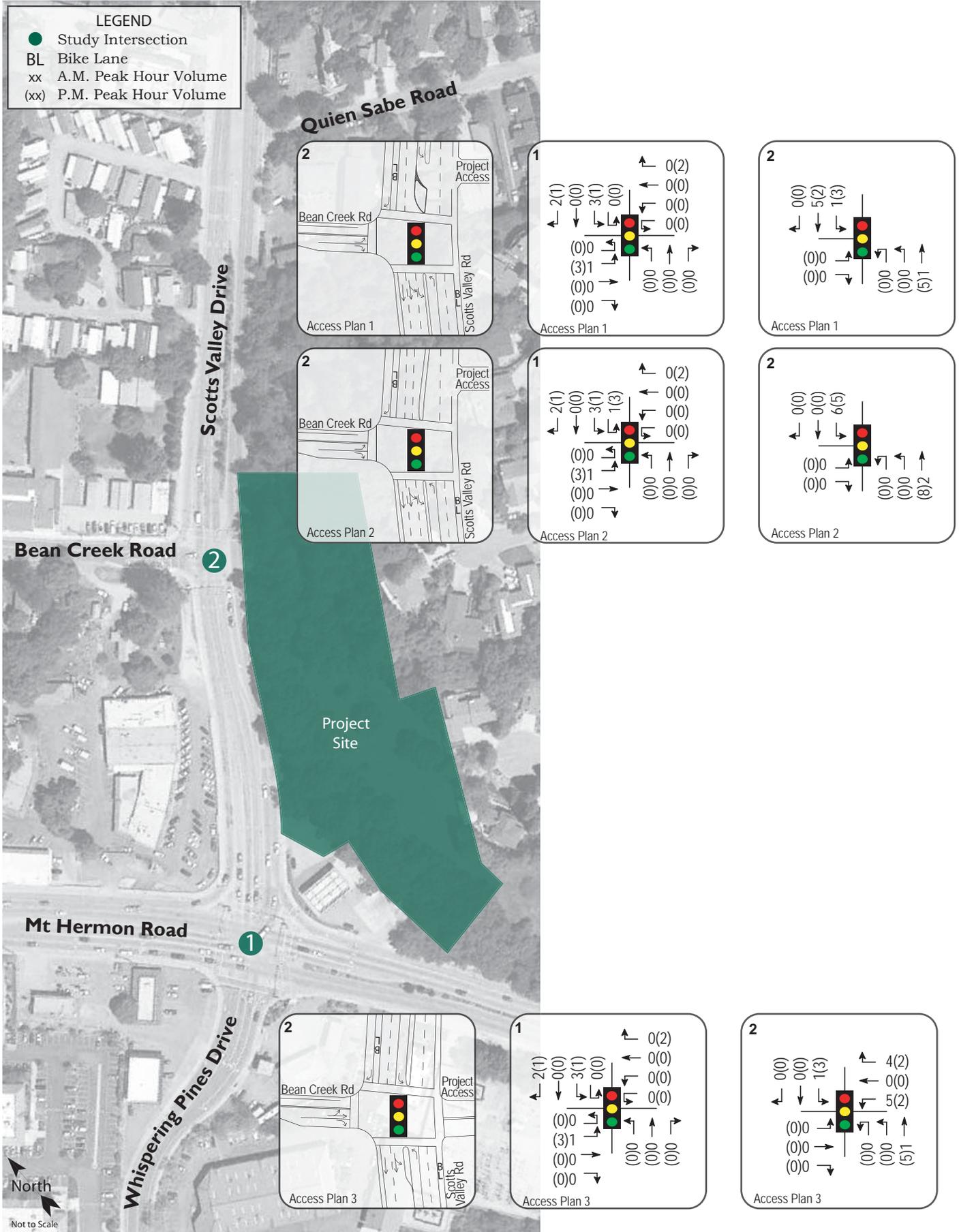
##### *Access Plan I - Proposed Access Improvements*

Project access improvements proposed under Access Plan I would modify the southbound approach to Scotts Valley Drive/Bean Creek Road to one left-turn lane and two through lanes. Upon the addition of project-related traffic to the street network, including the proposed intersection modifications at Scotts Valley Drive/Bean Creek Road, the study intersections are expected to continue to operate acceptably with no change in Level of Service. These results are summarized in Table 7. Project traffic volumes under Access Plan I are shown in Figure 4.

**Table 7  
Existing and Existing plus Project (Access Plan I) Intersection LOS**

Study Intersection	Existing Conditions				Existing plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Scotts Valley Dr-Whispering Pines Dr/ Mt. Hermon Rd	37.2	D	43.7	D	39.6	D	46.1	D
2. Scotts Valley Dr/Bean Creek Rd	16.7	B	14.2	B	17.6	B	15.3	B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service



Scotts Valley Townhomes Traffic Impact Study  
**Figure 4 – Project Traffic Volumes**

*Access Plan 2 – Existing Access Conditions*

Under Access Plan 2, there are no proposed modifications to the road configuration. Outgoing trips would be required to make a right-turn onto Scotts Valley Drive northbound. Incoming trips could only access the site from Scotts Valley Drive northbound. With Access Plan 2, the study intersections are expected to continue to operate acceptably with no change in Level of Service. However, southbound vehicles travelling to the project would be required to make a U-turn at the Scotts Valley Drive/Mt. Hermon Road intersection. Although this only slightly increases the delay compared to Access Plan 1, the extended distance required for drivers to travel may induce some illegal U-turns at the Bean Creek Road intersection potentially causing safety conflicts. These results are summarized in Table 8. Project traffic volumes under Access Plan 2 are shown in Figure 4.

**Table 8  
Existing and Existing plus Project (Access Plan 2) Intersection LOS**

Study Intersection	Existing Conditions				Existing plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Scotts Valley Dr-Whispering Pines Dr/ Mt. Hermon Rd	37.2	D	43.7	D	39.7	D	46.2	D
2. Scotts Valley Dr/Bean Creek Rd	16.7	B	14.2	B	16.7	B	14.1	B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

*Access Plan 3 – Bean Creek Alignment Plan*

Project access improvements proposed under Access Plan 3 would re-align the access to the project site and Bean Creek Road. This would create a signalized four-way intersection at Bean Creek Road and Scotts Valley Drive. There would be a designated left turn on southbound Scotts Valley Drive into the site. With Access Plan 3, the study intersections are expected to continue to operate acceptably. However there would be an increased delay at the realigned Bean Creek Road intersection, resulting to a lower LOS from LOS B to LOS C during the a.m. peak. This access plan causes the worst LOS and highest delay at the Scotts Valley Drive/Bean Creek Road intersection between the three plans. These results are summarized in Table 9. Project traffic volumes are shown in Figure 4.

**Table 9  
Existing and Existing plus Project (Access Plan 3) Intersection LOS**

Study Intersection	Existing Conditions				Existing plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Scotts Valley Dr-Whispering Pines Dr/ Mt. Hermon Rd	37.2	D	43.7	D	38.7	D	46.9	D
2. Scotts Valley Dr/Bean Creek Rd	16.7	B	14.2	B	22.3	C	18.9	B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

*Findings:* The study intersections are expected to continue operating acceptably upon the addition of project-generated traffic under all site access plans considered. Access Plan 1 results in the least delay to the Scotts Valley Drive/Mt. Hermon Road intersection. Access Plan 2 creates the potential for vehicles

to make illegal U-turns at the Scotts Valley Drive/Bean Creek Road intersection potentially causing safety conflicts. Access Plan 3 results in the highest delay to the Scotts Valley Drive/Bean Creek Road intersection which changes the Level of Service from LOS B to LOS C.

## Conclusions and Recommendations

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### Conclusions

- The proposed project is expected to generate an average of 139 daily vehicle trips, which includes 11 new a.m. peak hour trips and 12 new p.m. peak hour trips.
- All three site Access Plans considered would result in adequate access. However, it is worth noting that Access Plan 3 would require redesign of the project and significant grading changes to overcome the topographic constraints east of Scotts Valley Drive/Bean Creek Road.
- Both of the study intersections along Scotts Valley Drive are currently operating acceptably.
- Under all three site Access Plans analyzed, the two study intersections are expected to continue operating acceptably under volumes with project-added trips.
- Access Plan 1 results in the least delay to the Scotts Valley Drive/Mt. Hermon Road intersection. Access Plan 2 creates the potential for vehicles to make illegal U-turns at the Scotts Valley Drive/Bean Creek Road intersection potentially causing safety conflicts. Access Plan 3 results in the highest delay to the Scotts Valley Drive/Bean Creek Road intersection which changes the Level of Service from LOS B to LOS C.
- Existing pedestrian, bicycle, and transit facilities on Scotts Valley Drive are adequate to serve the proposed project.

### Recommendations

- Sidewalks should be installed throughout the project site and along the project driveway to create a continuous pedestrian connection to the street network.

## Study Participants and References

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### Study Participants

Principal in Charge: Steve Weinberger, PE, PTOE  
Transportation Engineer: Sam Lam, PE  
Technician/Graphics: Deborah J. Mizell  
Editing/Formatting: Angela McCoy  
Quality Control: Dalene J. Whitlock, PE, PTOE

### References

*2009 Collision Data on California State Highways*, California Department of Transportation, 2009  
*City of Scotts Valley Bicycle Transportation Plan*, Majid Yamin and Kimarie Jones, 2012  
*Highway Capacity Manual*, Transportation Research Board, 2000  
*Highway Design Manual*, 6<sup>th</sup> Edition, California Department of Transportation, 2012  
Santa Cruz Metro, <http://www.scmtd.com/en/routes>  
*Scotts Valley General Plan*, City of Scotts Valley, 1994  
*Statewide Integrated Traffic Records System (SWITRS)*, California Highway Patrol, 2007-2012

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## Appendix A

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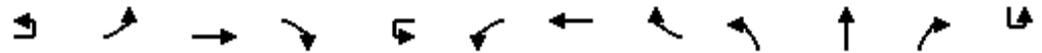
### Intersection Level of Service Calculations



# HCM Signalized Intersection Capacity Analysis

## 1: Whispering Pines Dr/Scotts Valley Dr & Mt Hermon Rd

10/17/2013



Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBU	
Lane Configurations		↔↔	↕↕			↔↔	↕↕	↔	↕	↔	↕		
Volume (vph)	28	352	849	27	13	68	541	443	47	116	151	27	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0		
Lane Util. Factor		0.97	0.95			1.00	0.95	1.00	0.95	0.95	1.00		
Frt		1.00	1.00			1.00	1.00	0.85	1.00	1.00	0.85		
Flt Protected		0.95	1.00			0.95	1.00	1.00	0.95	1.00	1.00		
Satd. Flow (prot)		3433	3523			1770	3539	1583	1681	1766	1583		
Flt Permitted		0.95	1.00			0.95	1.00	1.00	0.95	1.00	1.00		
Satd. Flow (perm)		3433	3523			1770	3539	1583	1681	1766	1583		
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	
Adj. Flow (vph)	32	400	965	31	15	77	615	503	53	132	172	31	
RTOR Reduction (vph)	0	0	2	0	0	0	0	0	0	0	149	0	
Lane Group Flow (vph)	0	432	994	0	0	92	615	503	48	137	23	0	
Turn Type	Prot	Prot	NA		Prot	Prot	NA	Free	Split	NA	Perm	Split	
Protected Phases	5	5	2		1	1	6		8	8		4	
Permitted Phases								Free				8	
Actuated Green, G (s)		19.6	57.7			10.7	48.8	120.0	16.0	16.0	16.0		
Effective Green, g (s)		19.6	57.7			10.7	48.8	120.0	16.0	16.0	16.0		
Actuated g/C Ratio		0.16	0.48			0.09	0.41	1.00	0.13	0.13	0.13		
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)		560	1693			157	1439	1583	224	235	211		
v/s Ratio Prot		c0.13	c0.28			0.05	0.17		0.03	c0.08			
v/s Ratio Perm								0.32			0.01		
v/c Ratio		0.77	0.59			0.59	0.43	0.32	0.21	0.58	0.11		
Uniform Delay, d1		48.1	22.5			52.5	25.6	0.0	46.4	48.9	45.7		
Progression Factor		1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2		6.5	1.5			5.5	0.9	0.5	0.5	3.7	0.2		
Delay (s)		54.6	24.0			58.0	26.5	0.5	46.9	52.5	46.0		
Level of Service		D	C			E	C	A	D	D	D		
Approach Delay (s)			33.3				18.1			48.6			
Approach LOS			C				B			D			
<b>Intersection Summary</b>													
HCM 2000 Control Delay			29.2									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.67										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	16.0
Intersection Capacity Utilization			62.2%									ICU Level of Service	B
Analysis Period (min)			15										
c	Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
 1: Whispering Pines Dr/Scotts Valley Dr & Mt Hermon Rd

10/17/2013



Movement	SBL	SBT	SBR
Lane Configurations			
Volume (vph)	348	55	208
Ideal Flow (vphpl)	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00
Frt	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583
Flt Permitted	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583
Peak-hour factor, PHF	0.88	0.88	0.88
Adj. Flow (vph)	395	62	236
RTOR Reduction (vph)	0	0	0
Lane Group Flow (vph)	426	62	236
Turn Type	Split	NA	Free
Protected Phases	4	4	
Permitted Phases			Free
Actuated Green, G (s)	19.6	19.6	120.0
Effective Green, g (s)	19.6	19.6	120.0
Actuated g/C Ratio	0.16	0.16	1.00
Clearance Time (s)	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	
Lane Grp Cap (vph)	560	304	1583
v/s Ratio Prot	c0.12	0.03	
v/s Ratio Perm			0.15
v/c Ratio	0.76	0.20	0.15
Uniform Delay, d1	48.0	43.4	0.0
Progression Factor	0.84	0.85	1.00
Incremental Delay, d2	6.0	0.3	0.2
Delay (s)	46.1	37.3	0.2
Level of Service	D	D	A
Approach Delay (s)		30.4	
Approach LOS		C	

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 2: Scotts Valley Dr & Bean Creek Rd

10/17/2013



Movement	EBL	EBR	NBU	NBL	NBT	SBT	SBR
Lane Configurations							
Volume (vph)	119	160	17	99	884	464	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	0.95	0.91	1.00
Frt	1.00	0.85		1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	3539	5085	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583		1770	3539	5085	1583
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	149	200	21	124	1105	580	138
RTOR Reduction (vph)	0	174	0	0	0	0	49
Lane Group Flow (vph)	149	26	0	145	1105	580	89
Turn Type	NA	Perm	Prot	Prot	NA	NA	Perm
Protected Phases	4		5	5	2	6	
Permitted Phases		4					6
Actuated Green, G (s)	15.5	15.5		15.2	96.5	77.3	77.3
Effective Green, g (s)	15.5	15.5		15.2	96.5	77.3	77.3
Actuated g/C Ratio	0.13	0.13		0.13	0.80	0.64	0.64
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)	228	204		224	2845	3275	1019
v/s Ratio Prot	c0.08			c0.08	c0.31	0.11	
v/s Ratio Perm		0.02					0.06
v/c Ratio	0.65	0.13		0.65	0.39	0.18	0.09
Uniform Delay, d1	49.7	46.3		49.9	3.3	8.6	8.0
Progression Factor	1.00	1.00		0.96	1.59	1.00	1.00
Incremental Delay, d2	6.6	0.3		5.9	0.4	0.1	0.2
Delay (s)	56.3	46.5		53.7	5.7	8.7	8.2
Level of Service	E	D		D	A	A	A
Approach Delay (s)	50.7				11.3	8.6	
Approach LOS	D				B	A	

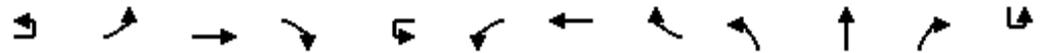
### Intersection Summary

HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	37.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Signalized Intersection Capacity Analysis

## 1: Whispering Pines Dr/Scotts Valley Dr & Mt Hermon Rd

10/17/2013



Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBU
Lane Configurations		↔↔	↕↕			↔	↕↕	↕	↕	↕	↕	
Volume (vph)	41	368	678	88	12	167	1209	324	117	53	86	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		0.97	0.95			1.00	0.95	1.00	0.95	0.95	1.00	
Frt		1.00	0.98			1.00	1.00	0.85	1.00	1.00	0.85	
Flt Protected		0.95	1.00			0.95	1.00	1.00	0.95	0.98	1.00	
Satd. Flow (prot)		3433	3478			1770	3539	1583	1681	1737	1583	
Flt Permitted		0.95	1.00			0.95	1.00	1.00	0.95	0.98	1.00	
Satd. Flow (perm)		3433	3478			1770	3539	1583	1681	1737	1583	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	44	396	729	95	13	180	1300	348	126	57	92	5
RTOR Reduction (vph)	0	0	7	0	0	0	0	0	0	0	81	0
Lane Group Flow (vph)	0	440	817	0	0	193	1300	348	91	92	11	0
Turn Type	Prot	Prot	NA		Prot	Prot	NA	Free	Split	NA	Perm	Split
Protected Phases	5	5	2		1	1	6		8	8		4
Permitted Phases								Free				8
Actuated Green, G (s)		19.5	52.4			17.5	50.4	120.0	14.6	14.6	14.6	
Effective Green, g (s)		19.5	52.4			17.5	50.4	120.0	14.6	14.6	14.6	
Actuated g/C Ratio		0.16	0.44			0.15	0.42	1.00	0.12	0.12	0.12	
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)		557	1518			258	1486	1583	204	211	192	
v/s Ratio Prot		c0.13	0.23			0.11	c0.37		0.05	0.05		
v/s Ratio Perm								0.22				0.01
v/c Ratio		0.79	0.54			0.75	0.87	0.22	0.45	0.44	0.06	
Uniform Delay, d1		48.3	24.9			49.1	31.9	0.0	48.9	48.9	46.6	
Progression Factor		1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		7.4	1.4			11.2	7.5	0.3	1.6	1.4	0.1	
Delay (s)		55.6	26.3			60.4	39.4	0.3	50.5	50.3	46.7	
Level of Service		E	C			E	D	A	D	D	D	
Approach Delay (s)			36.5				34.2			49.2		
Approach LOS			D				C			D		

### Intersection Summary

HCM 2000 Control Delay	33.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
 1: Whispering Pines Dr/Scotts Valley Dr & Mt Hermon Rd

10/17/2013



Movement	SBL	SBT	SBR
Lane Configurations			
Volume (vph)	386	117	594
Ideal Flow (vphpl)	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00
Frt	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00
Satd. Flow (prot)	3433	1863	1583
Flt Permitted	0.95	1.00	1.00
Satd. Flow (perm)	3433	1863	1583
Peak-hour factor, PHF	0.93	0.93	0.93
Adj. Flow (vph)	415	126	639
RTOR Reduction (vph)	0	0	0
Lane Group Flow (vph)	420	126	639
Turn Type	Split	NA	Free
Protected Phases	4	4	
Permitted Phases			Free
Actuated Green, G (s)	19.5	19.5	120.0
Effective Green, g (s)	19.5	19.5	120.0
Actuated g/C Ratio	0.16	0.16	1.00
Clearance Time (s)	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	
Lane Grp Cap (vph)	557	302	1583
v/s Ratio Prot	c0.12	0.07	
v/s Ratio Perm			c0.40
v/c Ratio	0.75	0.42	0.40
Uniform Delay, d1	48.0	45.1	0.0
Progression Factor	1.09	1.15	1.00
Incremental Delay, d2	5.5	0.9	0.7
Delay (s)	57.7	53.0	0.7
Level of Service	E	D	A
Approach Delay (s)		26.5	
Approach LOS		C	

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 2: Scotts Valley Dr & Bean Creek Rd

10/17/2013



Movement	EBL	EBR	NBU	NBL	NBT	SBT	SBR
Lane Configurations							
Volume (vph)	127	74	48	88	660	990	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	0.95	0.91	1.00
Frt	1.00	0.85		1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583		1770	3539	5085	1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583		1770	3539	5085	1583
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	149	87	56	104	776	1165	173
RTOR Reduction (vph)	0	73	0	0	0	0	60
Lane Group Flow (vph)	149	14	0	160	776	1165	113
Turn Type	NA	Perm	Prot	Prot	NA	NA	Perm
Protected Phases	4		5	5	2	6	
Permitted Phases		4					6
Actuated Green, G (s)	15.4	15.4		16.1	96.6	76.5	76.5
Effective Green, g (s)	15.4	15.4		16.1	96.6	76.5	76.5
Actuated g/C Ratio	0.13	0.13		0.13	0.80	0.64	0.64
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)	227	203		237	2848	3241	1009
v/s Ratio Prot	c0.08			c0.09	0.22	c0.23	
v/s Ratio Perm		0.01					0.07
v/c Ratio	0.66	0.07		0.68	0.27	0.36	0.11
Uniform Delay, d1	49.8	46.0		49.5	2.9	10.2	8.5
Progression Factor	1.00	1.00		0.96	0.74	1.00	1.00
Incremental Delay, d2	6.7	0.1		6.8	0.2	0.3	0.2
Delay (s)	56.5	46.1		54.1	2.4	10.5	8.7
Level of Service	E	D		D	A	B	A
Approach Delay (s)	52.7				11.2	10.3	
Approach LOS	D				B	B	

### Intersection Summary

HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM 2010 Signalized Intersection Summary  
 1: Whispering Pines Dr/Scotts Valley Dr & Mt Hermon Rd

3/5/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	381	849	27	81	541	443	47	116	151	378	55	210
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, 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
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	433	965	31	92	615	0	53	132	172	430	62	0
Adj No. of Lanes	2	2	0	1	2	1	1	1	1	2	1	1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	503	1832	59	116	1566	701	230	242	206	510	276	235
Arrive On Green	0.15	0.52	0.52	0.07	0.44	0.00	0.13	0.13	0.13	0.05	0.05	0.00
Sat Flow, veh/h	3442	3500	112	1774	3539	1583	1774	1863	1583	3442	1863	1583
Grp Volume(v), veh/h	433	488	508	92	615	0	53	132	172	430	62	0
Grp Sat Flow(s),veh/h/ln	1721	1770	1843	1774	1770	1583	1774	1863	1583	1721	1863	1583
Q Serve(g_s), s	14.7	21.8	21.8	6.1	14.1	0.0	3.2	8.0	12.7	14.9	3.8	0.0
Cycle Q Clear(g_c), s	14.7	21.8	21.8	6.1	14.1	0.0	3.2	8.0	12.7	14.9	3.8	0.0
Prop In Lane	1.00		0.06	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	503	926	964	116	1566	701	230	242	206	510	276	235
V/C Ratio(X)	0.86	0.53	0.53	0.80	0.39	0.00	0.23	0.55	0.84	0.84	0.22	0.00
Avail Cap(c_a), veh/h	631	926	964	177	1566	701	325	342	290	631	342	290
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.95	0.95	0.00
Uniform Delay (d), s/veh	50.1	18.8	18.8	55.3	22.6	0.0	46.8	48.9	51.0	55.7	50.4	0.0
Incr Delay (d2), s/veh	9.8	2.1	2.1	13.1	0.7	0.0	0.5	1.9	13.6	8.1	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	7.7	11.1	11.6	3.4	7.0	0.0	1.6	4.2	6.3	7.7	2.0	0.0
LnGrp Delay(d),s/veh	59.8	21.0	20.9	68.4	23.3	0.0	47.3	50.8	64.6	63.8	50.8	0.0
LnGrp LOS	E	C	C	E	C		D	D	E	E	D	
Approach Vol, veh/h		1429			707			357			492	
Approach Delay, s/veh		32.7			29.2			56.9			62.1	
Approach LOS		C			C			E			E	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.8	66.8		21.8	21.5	57.1		19.6				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	12.0	48.0		22.0	22.0	38.0		22.0				
Max Q Clear Time (g_c+I1), s	8.1	23.8		16.9	16.7	16.1		14.7				
Green Ext Time (p_c), s	0.1	11.8		0.9	0.8	11.2		0.9				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			39.6									
HCM 2010 LOS			D									

# HCM 2010 Signalized Intersection Summary

## 2: Scotts Valley Dr & Bean Creek Rd

3/5/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	119	0	160	0	0	0	116	885	0	1	469	110
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	0	1863				1863	1863	0	1863	1863	1863
Adj Flow Rate, veh/h	149	0	200				145	1106	0	1	586	138
Adj No. of Lanes	1	0	1				1	2	0	1	2	1
Peak Hour Factor	0.80	0.80	0.80				0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	0	2				2	2	0	2	2	2
Cap, veh/h	262	0	234				175	2658	0	2	2313	1035
Arrive On Green	0.15	0.00	0.15				0.10	0.75	0.00	0.00	0.65	0.65
Sat Flow, veh/h	1774	0	1583				1774	3632	0	1774	3539	1583
Grp Volume(v), veh/h	149	0	200				145	1106	0	1	586	138
Grp Sat Flow(s),veh/h/ln	1774	0	1583				1774	1770	0	1774	1770	1583
Q Serve(g_s), s	9.4	0.0	14.8				9.6	13.6	0.0	0.1	8.3	4.0
Cycle Q Clear(g_c), s	9.4	0.0	14.8				9.6	13.6	0.0	0.1	8.3	4.0
Prop In Lane	1.00		1.00				1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	262	0	234				175	2658	0	2	2313	1035
V/C Ratio(X)	0.57	0.00	0.85				0.83	0.42	0.00	0.52	0.25	0.13
Avail Cap(c_a), veh/h	458	0	409				384	2658	0	89	2313	1035
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.83	0.83	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.6	0.0	49.9				53.1	5.4	0.0	59.9	8.6	7.9
Incr Delay (d2), s/veh	1.9	0.0	8.6				8.1	0.4	0.0	132.8	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	4.7	0.0	12.8				5.1	6.8	0.0	0.1	4.1	1.8
LnGrp Delay(d),s/veh	49.5	0.0	58.4				61.2	5.8	0.0	192.7	8.9	8.2
LnGrp LOS	D		E				E	A		F	A	A
Approach Vol, veh/h		349						1251			725	
Approach Delay, s/veh		54.6						12.2			9.0	
Approach LOS		D						B			A	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs	1	2		4	5	6						
Phs Duration (G+Y+Rc), s	4.1	94.1		21.8	15.8	82.4						
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0						
Max Green Setting (Gmax), s	6.0	71.0		31.0	26.0	51.0						
Max Q Clear Time (g_c+I1), s	2.1	15.6		16.8	11.6	10.3						
Green Ext Time (p_c), s	0.0	19.9		1.0	0.3	17.9						
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			17.6									
HCM 2010 LOS			B									

HCM 2010 Signalized Intersection Summary  
 1: Whispering Pines Dr/Scotts Valley Dr & Mt Hermon Rd

3/5/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	412	678	88	179	1209	326	117	53	86	392	117	595
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, 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
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	443	729	95	192	1300	0	126	57	92	422	126	0
Adj No. of Lanes	2	2	0	1	2	1	1	1	1	2	1	1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	880	1593	208	221	1327	594	163	172	146	495	268	228
Arrive On Green	0.26	0.51	0.51	0.12	0.38	0.00	0.09	0.09	0.09	0.24	0.24	0.00
Sat Flow, veh/h	3442	3150	410	1774	3539	1583	1774	1863	1583	3442	1863	1583
Grp Volume(v), veh/h	443	409	415	192	1300	0	126	57	92	422	126	0
Grp Sat Flow(s),veh/h/ln	1721	1770	1790	1774	1770	1583	1774	1863	1583	1721	1863	1583
Q Serve(g_s), s	13.2	17.8	17.9	12.7	43.5	0.0	8.3	3.4	6.7	14.1	7.0	0.0
Cycle Q Clear(g_c), s	13.2	17.8	17.9	12.7	43.5	0.0	8.3	3.4	6.7	14.1	7.0	0.0
Prop In Lane	1.00		0.23	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	880	895	906	221	1327	594	163	172	146	495	268	228
V/C Ratio(X)	0.50	0.46	0.46	0.87	0.98	0.00	0.77	0.33	0.63	0.85	0.47	0.00
Avail Cap(c_a), veh/h	880	895	906	310	1327	594	325	342	290	631	342	290
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.86	0.86	0.00
Uniform Delay (d), s/veh	38.2	19.1	19.1	51.5	37.0	0.0	53.2	51.0	52.5	44.4	41.7	0.0
Incr Delay (d2), s/veh	0.5	1.7	1.7	16.7	20.3	0.0	7.5	1.1	4.4	7.7	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	6.3	9.1	9.2	7.3	24.9	0.0	4.4	1.8	3.1	7.2	3.6	0.0
LnGrp Delay(d),s/veh	38.6	20.7	20.7	68.2	57.3	0.0	60.7	52.1	56.9	52.1	42.8	0.0
LnGrp LOS	D	C	C	E	E		E	D	E	D	D	
Approach Vol, veh/h		1267			1492			275			548	
Approach Delay, s/veh		27.0			58.7			57.7			49.9	
Approach LOS		C			E			E			D	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.0	64.7		21.3	34.7	49.0		15.1				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	21.0	39.0		22.0	15.0	45.0		22.0				
Max Q Clear Time (g_c+I1), s	14.7	19.9		16.1	15.2	45.5		10.3				
Green Ext Time (p_c), s	0.3	6.7		1.2	0.0	0.0		0.7				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			46.1									
HCM 2010 LOS			D									

# HCM 2010 Signalized Intersection Summary

## 2: Scotts Valley Dr & Bean Creek Rd

3/5/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	127	0	74	0	0	0	136	665	0	3	992	147
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	0	1863				1863	1863	0	1863	1863	1863
Adj Flow Rate, veh/h	149	0	87				160	782	0	4	1167	173
Adj No. of Lanes	1	0	1				1	2	0	1	2	1
Peak Hour Factor	0.85	0.85	0.85				0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	0	2				2	2	0	2	2	2
Cap, veh/h	184	0	164				190	2804	0	7	2440	1092
Arrive On Green	0.10	0.00	0.10				0.11	0.79	0.00	0.00	0.69	0.69
Sat Flow, veh/h	1774	0	1583				1774	3632	0	1774	3539	1583
Grp Volume(v), veh/h	149	0	87				160	782	0	4	1167	173
Grp Sat Flow(s),veh/h/ln	1774	0	1583				1774	1770	0	1774	1770	1583
Q Serve(g_s), s	9.9	0.0	6.3				10.6	7.1	0.0	0.3	18.3	4.6
Cycle Q Clear(g_c), s	9.9	0.0	6.3				10.6	7.1	0.0	0.3	18.3	4.6
Prop In Lane	1.00		1.00				1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	184	0	164				190	2804	0	7	2440	1092
V/C Ratio(X)	0.81	0.00	0.53				0.84	0.28	0.00	0.54	0.48	0.16
Avail Cap(c_a), veh/h	370	0	330				325	2804	0	59	2440	1092
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.76	0.76	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.6	0.0	51.0				52.6	3.3	0.0	59.6	8.6	6.5
Incr Delay (d2), s/veh	8.3	0.0	2.6				7.6	0.2	0.0	50.1	0.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	5.3	0.0	5.6				5.6	3.4	0.0	0.2	9.1	2.1
LnGrp Delay(d),s/veh	60.9	0.0	53.7				60.2	3.5	0.0	109.8	9.3	6.8
LnGrp LOS	E		D				E	A		F	A	A
Approach Vol, veh/h		236						942			1344	
Approach Delay, s/veh		58.2						13.1			9.3	
Approach LOS		E						B			A	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs	1	2		4	5	6						
Phs Duration (G+Y+Rc), s	4.5	99.1		16.4	16.8	86.7						
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0						
Max Green Setting (Gmax), s	4.0	79.0		25.0	22.0	61.0						
Max Q Clear Time (g_c+I1), s	2.3	9.1		11.9	12.6	20.3						
Green Ext Time (p_c), s	0.0	27.3		0.6	0.3	21.9						
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			15.3									
HCM 2010 LOS			B									

HCM 2010 Signalized Intersection Summary  
 1: Whispering Pines Dr/Scotts Valley Dr & Mt Hermon Rd

3/5/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	381	849	27	81	541	443	47	116	151	379	55	210
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, 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
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	433	965	31	92	615	0	53	132	172	431	62	0
Adj No. of Lanes	2	2	0	1	2	1	1	1	1	2	1	1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	503	1831	59	116	1565	700	230	242	206	511	277	235
Arrive On Green	0.15	0.52	0.52	0.07	0.44	0.00	0.13	0.13	0.13	0.05	0.05	0.00
Sat Flow, veh/h	3442	3500	112	1774	3539	1583	1774	1863	1583	3442	1863	1583
Grp Volume(v), veh/h	433	488	508	92	615	0	53	132	172	431	62	0
Grp Sat Flow(s),veh/h/ln	1721	1770	1843	1774	1770	1583	1774	1863	1583	1721	1863	1583
Q Serve(g_s), s	14.7	21.8	21.8	6.1	14.1	0.0	3.2	8.0	12.7	14.9	3.8	0.0
Cycle Q Clear(g_c), s	14.7	21.8	21.8	6.1	14.1	0.0	3.2	8.0	12.7	14.9	3.8	0.0
Prop In Lane	1.00		0.06	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	503	926	964	116	1565	700	230	242	206	511	277	235
V/C Ratio(X)	0.86	0.53	0.53	0.80	0.39	0.00	0.23	0.55	0.84	0.84	0.22	0.00
Avail Cap(c_a), veh/h	631	926	964	177	1565	700	325	342	290	631	342	290
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.97	0.97	0.00
Uniform Delay (d), s/veh	50.1	18.8	18.8	55.3	22.6	0.0	46.8	48.9	51.0	55.7	50.4	0.0
Incr Delay (d2), s/veh	9.8	2.1	2.1	13.1	0.7	0.0	0.5	1.9	13.6	8.3	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	7.7	11.1	11.6	3.4	7.0	0.0	1.6	4.2	6.3	7.7	2.0	0.0
LnGrp Delay(d),s/veh	59.8	21.0	20.9	68.4	23.3	0.0	47.3	50.8	64.6	63.9	50.8	0.0
LnGrp LOS	E	C	C	E	C		D	D	E	E	D	
Approach Vol, veh/h		1429			707			357			493	
Approach Delay, s/veh		32.7			29.2			56.9			62.3	
Approach LOS		C			C			E			E	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.8	66.8		21.8	21.5	57.1		19.6				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	12.0	48.0		22.0	22.0	38.0		22.0				
Max Q Clear Time (g_c+I1), s	8.1	23.8		16.9	16.7	16.1		14.7				
Green Ext Time (p_c), s	0.1	11.8		0.9	0.8	11.2		0.9				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			39.7									
HCM 2010 LOS			D									

HCM 2010 Signalized Intersection Summary  
 2: Scotts Valley Dr & Bean Creek Rd

3/5/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	119	0	160	0	0	0	116	886	0	0	470	110
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	0	1863				1863	1863	0	0	1863	1863
Adj Flow Rate, veh/h	149	0	200				145	1108	0	0	588	138
Adj No. of Lanes	1	0	1				1	2	0	0	3	1
Peak Hour Factor	0.80	0.80	0.80				0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	0	2				2	2	0	0	2	2
Cap, veh/h	262	0	234				175	2780	0	0	3323	1035
Arrive On Green	0.15	0.00	0.15				0.10	0.79	0.00	0.00	0.65	0.65
Sat Flow, veh/h	1774	0	1583				1774	3632	0	0	5253	1583
Grp Volume(v), veh/h	149	0	200				145	1108	0	0	588	138
Grp Sat Flow(s),veh/h/ln	1774	0	1583				1774	1770	0	0	1695	1583
Q Serve(g_s), s	9.4	0.0	14.8				9.6	11.7	0.0	0.0	5.4	4.0
Cycle Q Clear(g_c), s	9.4	0.0	14.8				9.6	11.7	0.0	0.0	5.4	4.0
Prop In Lane	1.00		1.00				1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h	262	0	234				175	2780	0	0	3323	1035
V/C Ratio(X)	0.57	0.00	0.85				0.83	0.40	0.00	0.00	0.18	0.13
Avail Cap(c_a), veh/h	458	0	409				384	2780	0	0	3323	1035
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.83	0.83	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	47.6	0.0	49.9				53.1	4.0	0.0	0.0	8.1	7.9
Incr Delay (d2), s/veh	1.9	0.0	8.6				8.1	0.4	0.0	0.0	0.1	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	4.7	0.0	12.8				5.1	5.8	0.0	0.0	2.5	1.8
LnGrp Delay(d),s/veh	49.5	0.0	58.4				61.2	4.4	0.0	0.0	8.3	8.2
LnGrp LOS	D		E				E	A			A	A
Approach Vol, veh/h		349						1253			726	
Approach Delay, s/veh		54.6						11.0			8.2	
Approach LOS		D						B			A	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		98.2		21.8	15.8	82.4						
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0						
Max Green Setting (Gmax), s		71.0		31.0	26.0	51.0						
Max Q Clear Time (g_c+I1), s		13.7		16.8	11.6	7.4						
Green Ext Time (p_c), s		20.2		1.0	0.3	18.5						
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			16.7									
HCM 2010 LOS			B									

HCM 2010 Signalized Intersection Summary  
 1: Whispering Pines Dr/Scotts Valley Dr & Mt Hermon Rd

3/5/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	412	678	88	179	1209	326	117	53	86	395	117	595
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, 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
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	443	729	95	192	1300	0	126	57	92	425	126	0
Adj No. of Lanes	2	2	0	1	2	1	1	1	1	2	1	1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	877	1591	207	221	1327	594	163	172	146	498	269	229
Arrive On Green	0.25	0.51	0.51	0.12	0.38	0.00	0.09	0.09	0.09	0.24	0.24	0.00
Sat Flow, veh/h	3442	3150	410	1774	3539	1583	1774	1863	1583	3442	1863	1583
Grp Volume(v), veh/h	443	409	415	192	1300	0	126	57	92	425	126	0
Grp Sat Flow(s),veh/h/ln	1721	1770	1790	1774	1770	1583	1774	1863	1583	1721	1863	1583
Q Serve(g_s), s	13.2	17.9	17.9	12.7	43.5	0.0	8.3	3.4	6.7	14.2	6.9	0.0
Cycle Q Clear(g_c), s	13.2	17.9	17.9	12.7	43.5	0.0	8.3	3.4	6.7	14.2	6.9	0.0
Prop In Lane	1.00		0.23	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	877	894	904	221	1327	594	163	172	146	498	269	229
V/C Ratio(X)	0.51	0.46	0.46	0.87	0.98	0.00	0.77	0.33	0.63	0.85	0.47	0.00
Avail Cap(c_a), veh/h	877	894	904	310	1327	594	325	342	290	631	342	290
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.94	0.94	0.00
Uniform Delay (d), s/veh	38.2	19.1	19.1	51.5	37.0	0.0	53.2	51.0	52.5	44.3	41.6	0.0
Incr Delay (d2), s/veh	0.5	1.7	1.7	16.7	20.3	0.0	7.5	1.1	4.4	8.6	1.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	6.3	9.1	9.2	7.3	24.9	0.0	4.4	1.8	3.1	7.3	3.6	0.0
LnGrp Delay(d),s/veh	38.7	20.8	20.8	68.2	57.3	0.0	60.7	52.1	56.9	52.9	42.7	0.0
LnGrp LOS	D	C	C	E	E		E	D	E	D	D	
Approach Vol, veh/h		1267			1492			275			551	
Approach Delay, s/veh		27.1			58.7			57.7			50.6	
Approach LOS		C			E			E			D	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.0	64.6		21.4	34.6	49.0		15.1				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	21.0	39.0		22.0	15.0	45.0		22.0				
Max Q Clear Time (g_c+I1), s	14.7	19.9		16.2	15.2	45.5		10.3				
Green Ext Time (p_c), s	0.3	6.7		1.2	0.0	0.0		0.7				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay				46.2								
HCM 2010 LOS				D								

HCM 2010 Signalized Intersection Summary  
 2: Scotts Valley Dr & Bean Creek Rd

3/5/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	127	0	74	0	0	0	136	668	0	0	995	147
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	0	1863				1863	1863	0	0	1863	1863
Adj Flow Rate, veh/h	149	0	87				160	786	0	0	1171	173
Adj No. of Lanes	1	0	1				1	2	0	0	3	1
Peak Hour Factor	0.85	0.85	0.85				0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	0	2				2	2	0	0	2	2
Cap, veh/h	184	0	164				190	2937	0	0	3507	1092
Arrive On Green	0.10	0.00	0.10				0.11	0.83	0.00	0.00	0.69	0.69
Sat Flow, veh/h	1774	0	1583				1774	3632	0	0	5253	1583
Grp Volume(v), veh/h	149	0	87				160	786	0	0	1171	173
Grp Sat Flow(s),veh/h/ln	1774	0	1583				1774	1770	0	0	1695	1583
Q Serve(g_s), s	9.9	0.0	6.3				10.6	5.8	0.0	0.0	11.1	4.6
Cycle Q Clear(g_c), s	9.9	0.0	6.3				10.6	5.8	0.0	0.0	11.1	4.6
Prop In Lane	1.00		1.00				1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h	184	0	164				190	2937	0	0	3507	1092
V/C Ratio(X)	0.81	0.00	0.53				0.84	0.27	0.00	0.00	0.33	0.16
Avail Cap(c_a), veh/h	370	0	330				325	2937	0	0	3507	1092
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.76	0.76	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	52.6	0.0	51.0				52.6	2.2	0.0	0.0	7.5	6.5
Incr Delay (d2), s/veh	8.3	0.0	2.6				7.6	0.2	0.0	0.0	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	5.3	0.0	5.6				5.6	2.9	0.0	0.0	5.3	2.1
LnGrp Delay(d),s/veh	60.9	0.0	53.7				60.2	2.4	0.0	0.0	7.8	6.8
LnGrp LOS	E		D				E	A			A	A
Approach Vol, veh/h		236						946			1344	
Approach Delay, s/veh		58.2						12.2			7.6	
Approach LOS		E						B			A	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		103.6		16.4	16.8	86.7						
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0						
Max Green Setting (Gmax), s		79.0		25.0	22.0	61.0						
Max Q Clear Time (g_c+I1), s		7.8		11.9	12.6	13.1						
Green Ext Time (p_c), s		27.0		0.6	0.3	23.4						
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			14.1									
HCM 2010 LOS			B									

HCM 2010 Signalized Intersection Summary  
 1: Whispering Pines Dr/Scotts Valley Dr & Mt Hermon Rd

3/5/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	381	849	27	81	541	443	47	116	151	378	55	210
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, 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
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	433	965	31	92	615	0	53	132	172	430	62	0
Adj No. of Lanes	2	2	0	1	2	1	1	1	1	2	1	1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	503	1838	59	116	1572	703	230	242	206	504	273	232
Arrive On Green	0.15	0.53	0.53	0.07	0.44	0.00	0.13	0.13	0.13	0.15	0.15	0.00
Sat Flow, veh/h	3442	3500	112	1774	3539	1583	1774	1863	1583	3442	1863	1583
Grp Volume(v), veh/h	433	488	508	92	615	0	53	132	172	430	62	0
Grp Sat Flow(s),veh/h/ln	1721	1770	1843	1774	1770	1583	1774	1863	1583	1721	1863	1583
Q Serve(g_s), s	14.7	21.7	21.7	6.1	14.0	0.0	3.2	8.0	12.7	14.6	3.5	0.0
Cycle Q Clear(g_c), s	14.7	21.7	21.7	6.1	14.0	0.0	3.2	8.0	12.7	14.6	3.5	0.0
Prop In Lane	1.00		0.06	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	503	929	968	116	1572	703	230	242	206	504	273	232
V/C Ratio(X)	0.86	0.53	0.53	0.80	0.39	0.00	0.23	0.55	0.84	0.85	0.23	0.00
Avail Cap(c_a), veh/h	631	929	968	177	1572	703	325	342	290	631	342	290
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.95	0.95	0.00
Uniform Delay (d), s/veh	50.1	18.7	18.7	55.3	22.4	0.0	46.8	48.9	51.0	49.9	45.2	0.0
Incr Delay (d2), s/veh	9.8	2.1	2.0	13.1	0.7	0.0	0.5	1.9	13.6	8.7	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	7.7	11.1	11.6	3.4	7.0	0.0	1.6	4.2	6.3	7.5	1.8	0.0
LnGrp Delay(d),s/veh	59.8	20.8	20.7	68.4	23.2	0.0	47.3	50.8	64.6	58.6	45.6	0.0
LnGrp LOS	E	C	C	E	C		D	D	E	E	D	
Approach Vol, veh/h		1429			707			357			492	
Approach Delay, s/veh		32.6			29.0			56.9			57.0	
Approach LOS		C			C			E			E	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.8	67.0		21.6	21.5	57.3		19.6				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	12.0	48.0		22.0	22.0	38.0		22.0				
Max Q Clear Time (g_c+I1), s	8.1	23.7		16.6	16.7	16.0		14.7				
Green Ext Time (p_c), s	0.1	11.8		1.0	0.8	11.2		0.9				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			38.7									
HCM 2010 LOS			D									

HCM 2010 Signalized Intersection Summary  
 2: Scotts Valley Dr & Bean Creek Rd

3/5/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	119	0	160	5	0	4	116	885	1	1	469	110
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, 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
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	149	0	200	6	0	5	145	1106	1	1	586	138
Adj No. of Lanes	0	1	1	0	1	0	1	2	0	1	2	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	260	0	232	9	0	8	171	2642	2	2	2240	1002
Arrive On Green	0.15	0.00	0.15	0.01	0.00	0.01	0.10	0.73	0.73	0.00	0.63	0.63
Sat Flow, veh/h	1774	0	1583	917	0	765	1774	3628	3	1774	3539	1583
Grp Volume(v), veh/h	149	0	200	11	0	0	145	539	568	1	586	138
Grp Sat Flow(s),veh/h/ln	1774	0	1583	1682	0	0	1774	1770	1862	1774	1770	1583
Q Serve(g_s), s	11.0	0.0	17.3	0.9	0.0	0.0	11.3	16.7	16.7	0.1	10.2	4.9
Cycle Q Clear(g_c), s	11.0	0.0	17.3	0.9	0.0	0.0	11.3	16.7	16.7	0.1	10.2	4.9
Prop In Lane	1.00		1.00	0.55		0.45	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	260	0	232	17	0	0	171	1289	1356	2	2240	1002
V/C Ratio(X)	0.57	0.00	0.86	0.66	0.00	0.00	0.85	0.42	0.42	0.52	0.26	0.14
Avail Cap(c_a), veh/h	393	0	351	192	0	0	329	1289	1356	76	2240	1002
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	0.83	0.83	0.83	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.7	0.0	58.4	69.1	0.0	0.0	62.2	7.4	7.4	69.9	11.3	10.3
Incr Delay (d2), s/veh	2.0	0.0	13.1	36.2	0.0	0.0	9.3	0.8	0.8	133.5	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	5.5	0.0	8.4	0.6	0.0	0.0	6.0	8.4	8.8	0.1	5.1	2.2
LnGrp Delay(d),s/veh	57.7	0.0	71.5	105.2	0.0	0.0	71.6	8.3	8.2	203.4	11.6	10.6
LnGrp LOS	E		E	F			E	A	A	F	B	B
Approach Vol, veh/h		349			11			1252			725	
Approach Delay, s/veh		65.6			105.2			15.6			11.7	
Approach LOS		E			F			B			B	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.2	106.0		24.5	17.5	92.6		5.4				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	6.0	71.0		31.0	26.0	51.0		16.0				
Max Q Clear Time (g_c+I1), s	2.1	18.7		19.3	13.3	12.2		2.9				
Green Ext Time (p_c), s	0.0	18.0		1.2	0.3	16.4		0.0				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			22.3									
HCM 2010 LOS			C									

HCM 2010 Signalized Intersection Summary  
 1: Whispering Pines Dr/Scotts Valley Dr & Mt Hermon Rd

3/5/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			 					 		 
Volume (veh/h)	412	678	88	179	1209	326	117	53	86	392	117	595
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, 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
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	443	729	95	192	1300	0	126	57	92	422	126	0
Adj No. of Lanes	2	2	0	1	2	1	1	1	1	2	1	1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	873	1587	207	221	1327	594	163	172	146	502	272	231
Arrive On Green	0.25	0.50	0.50	0.12	0.38	0.00	0.09	0.09	0.09	0.15	0.15	0.00
Sat Flow, veh/h	3442	3150	410	1774	3539	1583	1774	1863	1583	3442	1863	1583
Grp Volume(v), veh/h	443	409	415	192	1300	0	126	57	92	422	126	0
Grp Sat Flow(s),veh/h/ln	1721	1770	1790	1774	1770	1583	1774	1863	1583	1721	1863	1583
Q Serve(g_s), s	13.2	17.9	17.9	12.7	43.5	0.0	8.3	3.4	6.7	14.3	7.4	0.0
Cycle Q Clear(g_c), s	13.2	17.9	17.9	12.7	43.5	0.0	8.3	3.4	6.7	14.3	7.4	0.0
Prop In Lane	1.00		0.23	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	873	892	902	221	1327	594	163	172	146	502	272	231
V/C Ratio(X)	0.51	0.46	0.46	0.87	0.98	0.00	0.77	0.33	0.63	0.84	0.46	0.00
Avail Cap(c_a), veh/h	873	892	902	310	1327	594	325	342	290	631	342	290
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.86	0.86	0.00
Uniform Delay (d), s/veh	38.3	19.2	19.2	51.5	37.0	0.0	53.2	51.0	52.5	49.9	47.0	0.0
Incr Delay (d2), s/veh	0.5	1.7	1.7	16.7	20.3	0.0	7.5	1.1	4.4	7.2	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	6.3	9.2	9.3	7.3	24.9	0.0	4.4	1.8	3.1	7.3	3.9	0.0
LnGrp Delay(d),s/veh	38.8	20.9	20.9	68.2	57.3	0.0	60.7	52.1	56.9	57.1	48.0	0.0
LnGrp LOS	D	C	C	E	E		E	D	E	E	D	
Approach Vol, veh/h		1267			1492			275			548	
Approach Delay, s/veh		27.2			58.7			57.7			55.0	
Approach LOS		C			E			E			D	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.0	64.5		21.5	34.4	49.0		15.1				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	21.0	39.0		22.0	15.0	45.0		22.0				
Max Q Clear Time (g_c+I1), s	14.7	19.9		16.3	15.2	45.5		10.3				
Green Ext Time (p_c), s	0.3	6.7		1.2	0.0	0.0		0.7				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay				46.9								
HCM 2010 LOS				D								

HCM 2010 Signalized Intersection Summary  
 2: Scotts Valley Dr & Bean Creek Rd

3/5/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	127	0	74	2	0	2	136	665	5	3	992	147
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, 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
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	149	0	87	2	0	2	160	782	6	4	1167	173
Adj No. of Lanes	0	1	1	0	1	0	1	2	0	1	2	1
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	182	0	162	3	0	3	185	2790	21	7	2387	1068
Arrive On Green	0.10	0.00	0.10	0.00	0.00	0.00	0.10	0.77	0.77	0.00	0.67	0.67
Sat Flow, veh/h	1774	0	1583	837	0	837	1774	3600	28	1774	3539	1583
Grp Volume(v), veh/h	149	0	87	4	0	0	160	384	404	4	1167	173
Grp Sat Flow(s),veh/h/ln	1774	0	1583	1673	0	0	1774	1770	1858	1774	1770	1583
Q Serve(g_s), s	11.5	0.0	7.3	0.3	0.0	0.0	12.4	8.7	8.7	0.3	22.4	5.6
Cycle Q Clear(g_c), s	11.5	0.0	7.3	0.3	0.0	0.0	12.4	8.7	8.7	0.3	22.4	5.6
Prop In Lane	1.00		1.00	0.50		0.50	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	182	0	162	7	0	0	185	1371	1440	7	2387	1068
V/C Ratio(X)	0.82	0.00	0.54	0.58	0.00	0.00	0.86	0.28	0.28	0.55	0.49	0.16
Avail Cap(c_a), veh/h	317	0	283	191	0	0	279	1371	1440	51	2387	1068
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	0.76	0.76	0.76	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.5	0.0	59.7	69.6	0.0	0.0	61.7	4.5	4.5	69.6	11.1	8.3
Incr Delay (d2), s/veh	8.7	0.0	2.7	59.5	0.0	0.0	12.8	0.4	0.4	51.5	0.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	6.1	0.0	3.3	0.3	0.0	0.0	6.7	4.4	4.6	0.3	11.1	2.5
LnGrp Delay(d),s/veh	70.3	0.0	62.4	129.1	0.0	0.0	74.5	4.9	4.9	121.1	11.8	8.6
LnGrp LOS	E		E	F			E	A	A	F	B	A
Approach Vol, veh/h		236			4			948			1344	
Approach Delay, s/veh		67.4			129.1			16.6			11.7	
Approach LOS		E			F			B			B	
<b>Timer</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.6	112.5		18.4	18.6	98.4		4.6				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	4.0	79.0		25.0	22.0	61.0		16.0				
Max Q Clear Time (g_c+I1), s	2.3	10.7		13.5	14.4	24.4		2.3				
Green Ext Time (p_c), s	0.0	25.7		0.8	0.2	20.0		0.0				
<b>Intersection Summary</b>												
HCM 2010 Ctrl Delay			18.9									
HCM 2010 LOS			B									