APPENDIX 9.0
TRAFFIC ANALYSIS

Northstar Mountain Master Plan
Transportation Impact Analysis

Prepared for

PMC

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NORTHSTAR MOUNTAIN MASTER PLAN
TRANSPORTATION IMPACT ANALYSIS

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November 20, 2013

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EXECUTIVE SUMMARY

PURPOSE

This report presents the transportation impacts associated with the development of the Northstar Mountain Master Plan (NMMP) Project in the Northstar area of Placer County, California. The proposed project includes planned on-mountain improvements and infrastructure to accommodate these improvements, as well as other recreation components such as camping and relocation of cross-country ski facilities. Analysis is conducted for existing and long-term cumulative conditions. Proposed "Project-Level" improvements are evaluated, as well as conceptual "Program-Level" improvements.

FINDINGS

The findings of the Traffic Impact Analysis are as follows:

1. The Project-Level project is expected to result in an increase of up to 31 one-way vehicle-trips (5 inbound and 26 outbound) during the winter PM peak hour and approximately 104 one-way vehicle-trips over the course of a winter day. During the summer, the Project-Level project would result in an increase of approximately 3 PM peak-hour vehicle-trips (2 inbound and 1 outbound) and 15 one-way daily vehicle-trips. The Program-Level development is expected to result in an increase of approximately 192 daily one-way vehicle trips on a busy winter day, of which 57 (9 inbound and 48 outbound) would occur during the PM peak hour of skier-related traffic activity. On a busy summer day, the Program-Level development would result in an increase of approximately 94 daily one-way vehicle trips, of which 25 (10 inbound and 15 outbound) would occur during the PM peak hour. Note that the Program Level figures include the Project level development.

2. All of the study intersections operate at an acceptable Level of Service (LOS) during all analysis periods under existing and future cumulative conditions, with or without the project, so long as Traffic Control Officer is provided at the Northstar Drive/Castle Peak Parking Access/Ridgeline Drive roundabout and the Northstar Drive/Big Springs Drive intersection during busy winter periods.

3. Traffic queue lengths are not expected to exceed the existing storage capacity at any of the study intersections during any of the existing and future cumulative analysis periods, with or without the project.

4. All Placer County study roadway segments (Northstar Drive) currently operate within the LOS thresholds set forth in the Martis Valley Community Plan. However, the following segments along SR 267 currently exceed Caltrans' concept LOS (LOS D):

   - SR 267 between Brockway Summit and Northstar Drive - **summer and winter**
   - SR 267 between Northstar Drive and Airport Road - **winter only**
   - SR 267 between Airport Road and Placer/Nevada County Line - **summer and winter**

   Although the proposed project would increase traffic volumes, it would not cause any additional roadway segments to exceed any of the LOS thresholds in 2012. Furthermore, the project would result in a less than significant impact based on the County's Methodology of Assessment.

Under 2032 conditions, the same study roadway segments are expected to exceed Caltrans' concept LOS (LOS D), with or without the Master Plan project. The only difference is that the segment of SR 267 between Northstar Drive and Airport Road would exceed LOS D during both the summer and winter seasons, due to the growth in background traffic from 2012 to 2032. In addition, the segment of Northstar Drive between the roundabout and Big Springs Drive would exceed the Martis Valley Community Plan standard in the winter. Implementation of the project (Project Level or Program Level) is not expected to cause any additional roadway segments to exceed the LOS thresholds in 2032. Furthermore, the project would result in a less than significant impact based on the County's Methodology of Assessment, as it would not exceed the minimum LOS policies.

5. No driver sight distance deficiencies or other traffic safety-related concerns pertaining to the site access points are identified. In addition, no traffic safety concerns pertaining to the project's design features are identified.

6. The Project-Level development is estimated to increase daily VMT in the Tahoe Basin by approximately 296 over the course of a winter day, and 43 over the course of a summer day. At the Program Level, the resulting increase would be 598 winter VMT and 376 summer VMT. In comparison with the TRPA's 2011 estimate of 2,036,642 existing VMT on a summer day in the Tahoe Basin, the increase in region-wide VMT resulting from the Project-Level development is negligible. The Program-Level development is estimated to increase region-wide VMT by about 0.02 percent on a summer day. Basin-wide VMT is currently better than the TRPA's adopted threshold standard of 2,067,568 VMT, resulting in an "at or somewhat better than target" status determination. Implementation of the project (at any development level) would not cause the VMT threshold to be exceeded. Note the TRPA's VMT estimate pertains to an "annual peak day," which typically occurs during August.

7. While the additional transit demand associated with the additional employees generated by the Master Plan improvements by themselves may not warrant additional public transit services, the Plan would add to the cumulative need for additional winter peak-hour transit capacity serving Northstar.

8. The project would have no significant impacts on bicycling or pedestrian travel.

9. A total of approximately 50 daily one-way vehicle trips made external to Northstar are expected to be generated by construction employees over the course of a busy day during the summer season. Approximately 13 exiting trips are expected to occur during the summer PM peak hour. Adding this traffic and any miscellaneous material or equipment delivery trips to the existing summer PM peak-hour traffic is not expected to cause any of the study intersections or roadways to exceed the applicable LOS thresholds.

10. Approximately 44 parking spaces are associated with the Project-Level improvements on a busy winter day and about 84 parking spaces at the Program Level. As the additional employees would park in the same lots as the day skiers, there is the potential for the project to expand the days/durations when the rarely-used Golf Course Lot is utilized. There is also the potential for the Program-Level project to expand the days/durations when the Northstar parking lots reach capacity, although no parking deficiencies are expected. Additionally, ample parking is provided during the summer season. Overall, adequate parking conditions are expected to be provided with the project.

11. In general, the proposed Master Plan is consistent with the transportation goals and policies set forth in the adopted Martis Valley Community Plan.

RECOMMENDATIONS

The following mitigation measures are recommended to address transportation impacts with the proposed project:

1. Traffic Control Officers should continue to be provided at the Northstar Drive/Castle Peak Parking Access/Ridgeline Drive roundabout and the Northstar Drive/Big Springs Drive intersection during busy winter periods. Northstar's Traffic Management Plan includes this provision.

2. In addition, the Countywide Traffic Impact Fee Program requires new development within Placer County to pay traffic impact fees. The current traffic impact fee is $4,587 per Dwelling Unit Equivalent (DUE). Approximately 42.87 DUE are generated at the Project Level and a total of 77.47 DUE at the Program Level. Multiplying the respective DUEs by $4,587 yields total traffic impact fees of $196,644.69 at the Project Level and $355,354.89 at the Program Level. (Note that the Program Level fee is comprised of the $196,644.69 associated with the Project Level plus $158,710.20.) Fees are collected prior to issuance of building permits. The Placer County Capital Improvement Program includes improvements to the SR 28/SR 267 intersection in the Tahoe Basin. The project's payment of traffic impact fees would mitigate any potential intersection LOS impacts resulting from the project-generated traffic through this intersection.

3. Although the SR 267/Northstar Drive intersection is forecast to operate at an acceptable LOS under all study scenarios, future (ultimate) improvements at this intersection are subject to the payment of a fair-share contribution. The project's fair-share percent contribution is calculated to be approximately 4.8 percent based upon the portion of the total future growth in the winter peak-hour total intersection traffic volume that is represented by the Project-Level traffic, or 8.9 percent for the Program-Level development (including Project-Level improvements). Note that if the Placer County Board of Supervisors adopts an update to the current traffic mitigation fee ordinance, and the updated program includes this intersection location, that action and program will supersede the fair-share contribution requirements.

4. Widening of SR 267 to four lanes from Brockway Road/Soaring Way to south of Northstar Drive is included in the Placer County and Town of Truckee traffic impact fee programs. Widening of SR 267 between Brockway Summit and Northstar Drive is not included in the Countywide CIP. However, based upon the County's Methodology of Assessment, the project impact to SR 267 is considered less than significant. Therefore, no mitigation measures are required at this location.

   Widening of Northstar Drive to four lanes from SR 267 to Sawmill Flat Road (now referred to as Ridgeline Drive) is complete, and the County is no longer collecting funds toward this improvement. The County has determined that it is not appropriate to widen Northstar Drive west of Basque Road. However, consistent with The Northside EIR, widening Northstar Drive between the Castle Peak Access/Ridgeline Drive roundabout and Basque Road has been identified as a necessary improvement. In addition to the traffic impact fee, the project applicant shall pay its fair-share contribution toward future improvements on the segment of

Northstar Drive between the roundabout and Basque Drive. The fair-share percent contribution is calculated to be approximately 4.4 percent at the Project Level, or 7.8 percent at the Program Level (including the Project Level). It should be noted that detailed analysis of the traffic reductions occurring with a transport gondola (not within the scope of this study) could potentially reduce or eliminate this mitigation measure. Also, if the Placer County Board of Supervisors adopts an update to the current traffic mitigation fee ordinance, and the updated program includes this location, that action and program will supersede the fair-share contribution requirements.

5. Consistent with requirements placed on other development proposals in Northstar over the last several years, it is appropriate for the project applicant to participate in the capital and on-going operational requirements of additional transit service. Placer County has established County Service Area 28 (Zone of Benefit 204) to provide this funding mechanism for all development within Martis Valley (including Northstar). By paying into this County Service Area, the project applicant would be addressing this impact. The Dwelling Unit Equivalents (DUE) associated with the Project-Level and Program-Level proposals are 42.87 and 77.47 DUE, respectively. Multiplying by the current fee per DUE applied to the Northstar Northside project ($39.79) by the total DUE yields the total annual fees, as follows:

   - 42.87 DUE x $39.79/DUE = $1,705.80 at Project Level
   - 77.47 DUE x $39.79/DUE = $3,082.53 at Program Level

   Note that the Program-Level fee includes the Project-Level fee. As with other Zones of Benefit under the CSA program, assessments will be made on individual parcels. It will therefore be necessary to allocate the various development quantities to individual parcels. The allocation of DUE to each specific project parcel is provided in Table 15. Finally, the amount of assessment specified for each year is adjusted based upon the Consumer Price Index (up to a maximum of 5 percent per year).

6. With participation in the CSA funding transit service improvements, as well as its fair-share contribution to widening along Northstar Drive and future improvements at the SR 267/ Northstar Drive intersection, the project would be consistent with the transportation-related elements of the Martis Valley Community Plan.

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Section 1
INTRODUCTION

This engineering report documents the findings and conclusions of a transportation impact analysis for the Northstar Mountain Master Plan (NMMP) Project, which is located in the Northstar area of eastern Placer County, California. The purpose of this engineering study is to determine the impacts of the traffic generated by the project on the surrounding roadway infrastructure, as well as other transportation-related factors. This study determines if mitigation is required to allow transportation facilities to operate in conformance with adopted standards and consistent with pertinent policies under the current adopted Placer County standards. This project is planned to be constructed in several phases. However, the study examines the project-generated traffic volumes for both the proposed Project-Level buildout and the conceptual Program-Level buildout. This study also provides the technical basis for the NMMP Environmental Impact Report (EIR) Transportation Section.

SCOPE OF STUDY

This traffic engineering study analyzes traffic data, intersection capacity, level of service, and traffic impacts of the proposed project in accordance with the requirements of the Placer County, Town of Truckee, and Caltrans standards. The study also includes an evaluation of transit systems and facilities, bicycle and pedestrian safety and facilities, safety analysis of new driveway intersections including an evaluation of driver sight distance, additional traffic safety hazards created by design features, construction traffic impacts, parking impacts, and the Project's consistency with the *2003 Martis Valley Community Plan*. Based upon input provided by Placer County Engineering Department staff, the following intersections were identified for quantitative analysis:

- State Route (SR) 267/Northstar Drive
- Northstar Drive/Castle Peak Parking Lot/Ridgeline Drive (Roundabout)
- Northstar Drive/Big Springs Drive

In addition, a qualitative analysis of the project's impact to the SR 28/SR 267 intersection in the Tahoe Basin is provided.

The following roadway segments were identified for analysis:

- SR 267 between I-80 and Brockway Road
- SR 267 between Brockway Road and the Town of Truckee/Placer County Line
- SR 267 between the Town of Truckee/Placer County Line and Airport Road
- SR 267 between Airport Road and Northstar Drive
- SR 267 between Northstar Drive and Brockway Summit
- Northstar Drive between SR 267 and Castle Peak Parking Lot/Ridgeline Drive
- Northstar Drive between Castle Peak Parking Lot/Ridgeline Drive and Big Springs Drive

This analysis considers the following five scenarios:

1. Existing Year without Project
2. Existing Year with Project-Level Project
3. Long-Term Cumulative (20-Year Horizon) without Project
4. Long-Term Cumulative (20-Year Horizon) with Project-Level Project
5. Long-Term Cumulative (20-Year Horizon) with Program-Level Project

The results of this transportation study are used to develop recommendations to mitigate project transportation impacts.

Section 2
EXISTING CONDITIONS

This section documents the existing setting and operational traffic conditions in the vicinity of the Northstar area, providing a foundation for comparison to future conditions. Existing roadway conditions were studied to identify if the roadways are currently operating in a safe and efficient manner. The study area and the intersections evaluated are shown in Figure 1.

EXISTING SETTING

The Northstar California Ski Resort is located in the southern portion of the Martis Valley Community Plan area. Northstar provides year-round recreational activities, including skiing, snowboarding, hiking, biking, and golf.

Existing Roadways

The roadways within the study area are described below.

State Route 267

State Route (SR) 267 is a two-lane highway running in a general northwest-southeast alignment between the I-80/SR 89 North/SR 267 interchange in Truckee and SR 28 in Kings Beach. SR 267 is of local and regional significance, providing access to residential, industrial, commercial and recreational land uses. It serves as the major route between the I-80 corridor and North Lake Tahoe communities of Kings Beach and Tahoe Vista, California and Incline Village, Nevada. It also serves as the primary access to the Northstar California Ski Resort and adjacent residential neighborhoods. The peak month Average Daily Traffic (ADT) volume along this roadway is approximately 10,700-16,600 vehicles per day.

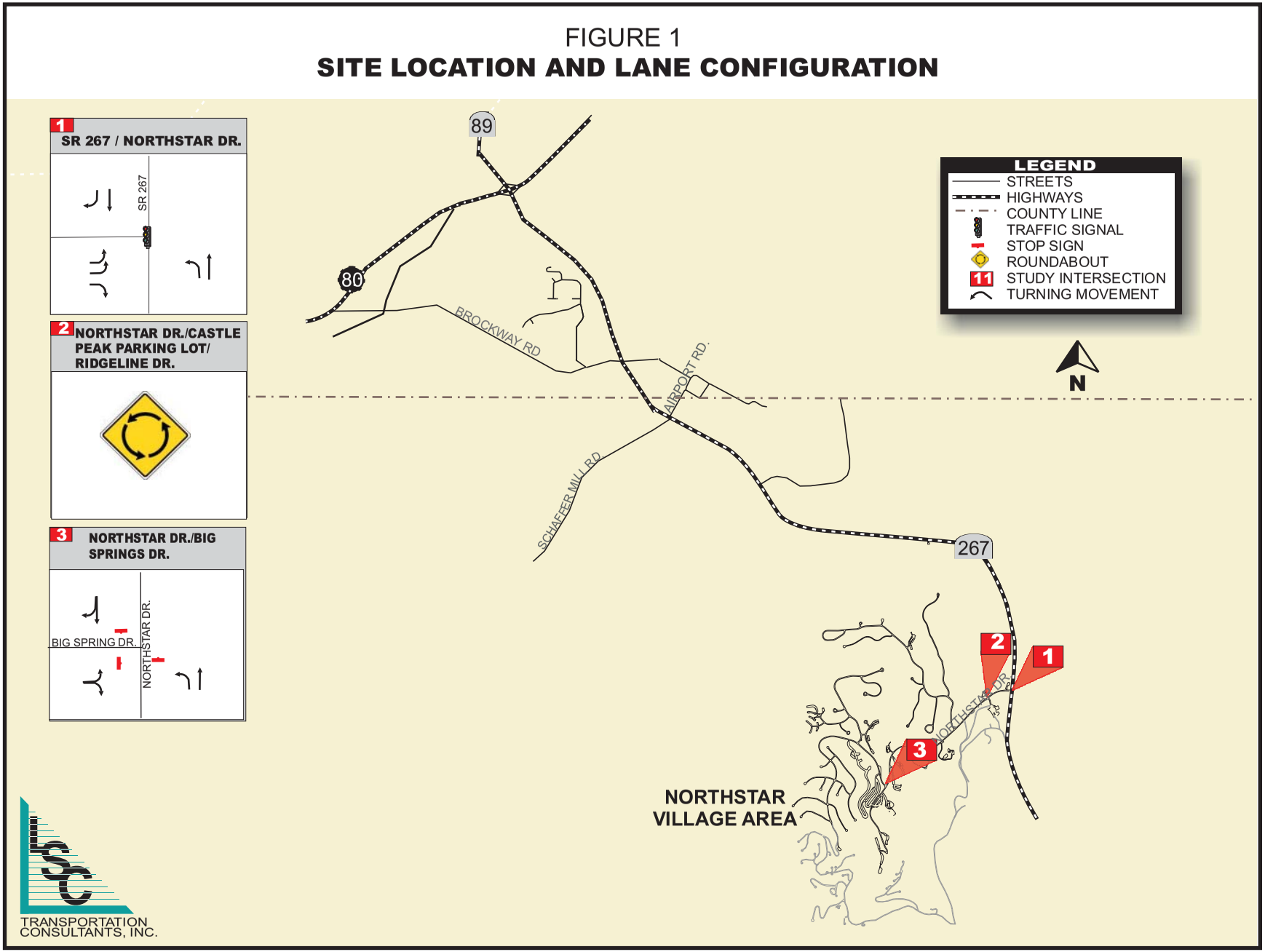
Northstar Drive

Northstar Drive is a two-lane arterial roadway connecting SR 267 on the east to the Northstar California Ski Resort community and the associated residential, commercial, and resort areas on the west. The posted speed limit along Northstar Drive is 35 miles per hour. Residential street intersections along Northstar Drive are controlled by stop signs on the side street approaches. Northstar Drive ends at the west in the Northstar Village area, which is the major commercial and resort center within the Northstar California resort in both the summer and winter seasons. A traffic control program conducted by Northstar California is in place on peak-days of winter traffic. As a part of this program, traffic control officers are stationed at the Northstar Drive/Castle Peak Lot/Ridgeline Drive roundabout and Northstar Drive/Big Springs Drive intersections on peak ski days.

Ridgeline Drive

Ridgeline Drive forms the southern leg of the Northstar Drive/Castle Peak Lot/Ridgeline Drive roundabout. This two-lane roadway connects Northstar Drive on the north to Highland View Road on the south, and it provides access to the Northstar-at-Tahoe Administrative Facility, California Department of Fire, and various County services buildings on the south side of Northstar Drive. On the north side of Northstar Drive opposite Ridgeline Drive is the Castle Peak Parking Area and gas station access driveway.

FIGURE 1
SITE LOCATION AND LANE CONFIGURATION



Big Springs Drive

Big Springs Drive is a two-lane major collector roadway, approximately one-half mile long, looping up from its intersection with Northstar Drive at the Village area north past its intersection with Martis Landing Drive, and then around to the west and south to its terminus southwest of the Village area. Uphill from its intersection with Martis Landing Drive, Big Springs Drive provides access to a single-family residential neighborhood via a series of small local streets and cul-de-sacs. Downhill from Martis Landing to Northstar Drive, access is provided to the day-use skier lots. Big Springs Drive is controlled by a stop sign at Northstar Drive. In addition, traffic control officers are stationed at the Northstar Drive/Big Springs Drive intersection on peak ski days.

The lane configuration and traffic control at the study intersections are illustrated in Figure 1.

Existing Traffic Volumes

Consistent with other EIRs completed for the eastern Placer County area, impacts on study roadways are determined by measuring the effect that site-generated traffic has on traffic operations at key intersections and along roadways during the following analysis periods:

- Winter 30th-Highest PM Peak Hour
- Summer Weekday PM Peak Hour

The winter peak hour is technically defined as the 30th-highest PM hour of travel demand during the ski season (Placer County, 2003). The 30th highest winter PM peak hour generally corresponds to a busy (but not the busiest) weekend day during ski season during the hour that ski areas are closing and skiers departing ski areas mix with local and inter-regional traffic. Summer peak is defined as the peak times of travel within the study area during the summer months, which generally occurs on Fridays. Peak traffic volumes considered in this study are both Average Daily Traffic (ADT) and the peak hour of demand, which occurs during the afternoon hours.

The existing traffic volumes were estimated based upon traffic counts conducted between 2010 and 2012. The traffic count data is contained in Appendix A. The estimation of the winter 30th-highest PM peak-hour and summer weekday PM peak-hour traffic volumes are described separately below.

Existing Winter Traffic Volumes

The existing winter 30th-highest peak-hour traffic volumes were estimated as follows:

Intersection PM peak-hour turning-movement counts were conducted at the following three study intersections:

- SR 267/Northstar Drive (Saturday, January 15, 2011)
- Northstar Drive/Castle Peak Parking Access/Ridgeline Drive (Saturday, December 22, 2012)
- Northstar Drive/Big Springs Drive (Saturday, March 27, 2010)

Caltrans hourly traffic count data collected at a point on SR 267 just south of the intersection with Brockway Road/Soaring Way in the Town of Truckee for the entire 2010/2011 winter was reviewed in order to identify the 30th highest hour design period. A factor of approximately 1.15 was applied to the traffic count data at the SR 267/Northstar Drive intersection, in order to adjust it to 30th-highest hour design period. Next, the traffic volumes along Northstar Drive were balanced through the adjacent Northstar Drive/Castle Peak Parking Access/Ridgeline Drive roundabout. The north and south legs of the roundabout were adjusted by the same factor as the east and west Northstar Drive legs, in order to reflect 30th-highest hour conditions. Finally, the count data at the intersection of Big Springs Drive/Northstar Drive was adjusted by the same factor applied to the roundabout intersection.

A review of Caltrans traffic volumes along SR 267 at Postmile 3.76 (Northstar Drive) over the last 5 years shows that traffic has increased at an average annual rate of approximately 1.6 percent. This growth rate was applied to the 2011 volumes at the SR 267/Northstar Drive intersection to estimate 2012 traffic conditions. The resulting existing winter PM peak-hour traffic volumes are shown in Figure 2.

The roadway analysis segments located within Placer County are evaluated based on ADT volumes. Consistent with other traffic studies in the Northstar area, the existing peak-season ADT on each study roadway was estimated by applying a factor to the peak-hour volume on each roadway, as follows:

- ADT-to-peak hour factors for SR 267 for winter was estimated based on data obtained from the Caltrans permanent traffic trend station located at a point on SR 267 south of Brockway Road. Average ADT-to- peak hour factors were calculated for the winter (December through April) count period.

- The winter ADT-to-peak hour factor for Northstar Drive was estimated based on daily winter counts conducted on Squaw Valley Road, as no daily winter counts are available on Northstar Drive. As Squaw Valley Road has similar characteristics to Northstar Drive (number of lanes, accessed at a T-intersection with a state highway) and serves very similar land uses (ski resort with village, lodging and residential properties), the winter ADT to peak hour factor along Squaw Valley Road was assumed to also be applicable to Northstar Drive.

The ADT-to-peak hour factors were then multiplied by the respective peak-hour roadway volumes to estimate the winter ADT on the study roadway segments, as shown in Table 1.

Existing Summer Traffic Volumes

Existing summer peak-hour intersection turning-movement volumes were estimated at the study intersections as described below.

Intersection PM peak-hour turning-movement counts were conducted at the following three study intersections:

- SR 267/Northstar Drive (Friday, August 26, 2011)
- Northstar Drive/Castle Peak Parking Access/Ridgeline Drive (Friday, August 12, 2011)
- Northstar Drive/Big Springs Drive (Friday, July 9, 2010)

FIGURE 2

EXISTING (2012) WINTER AND SUMMER INTERSECTION VOLUMES WITHOUT PROJECT

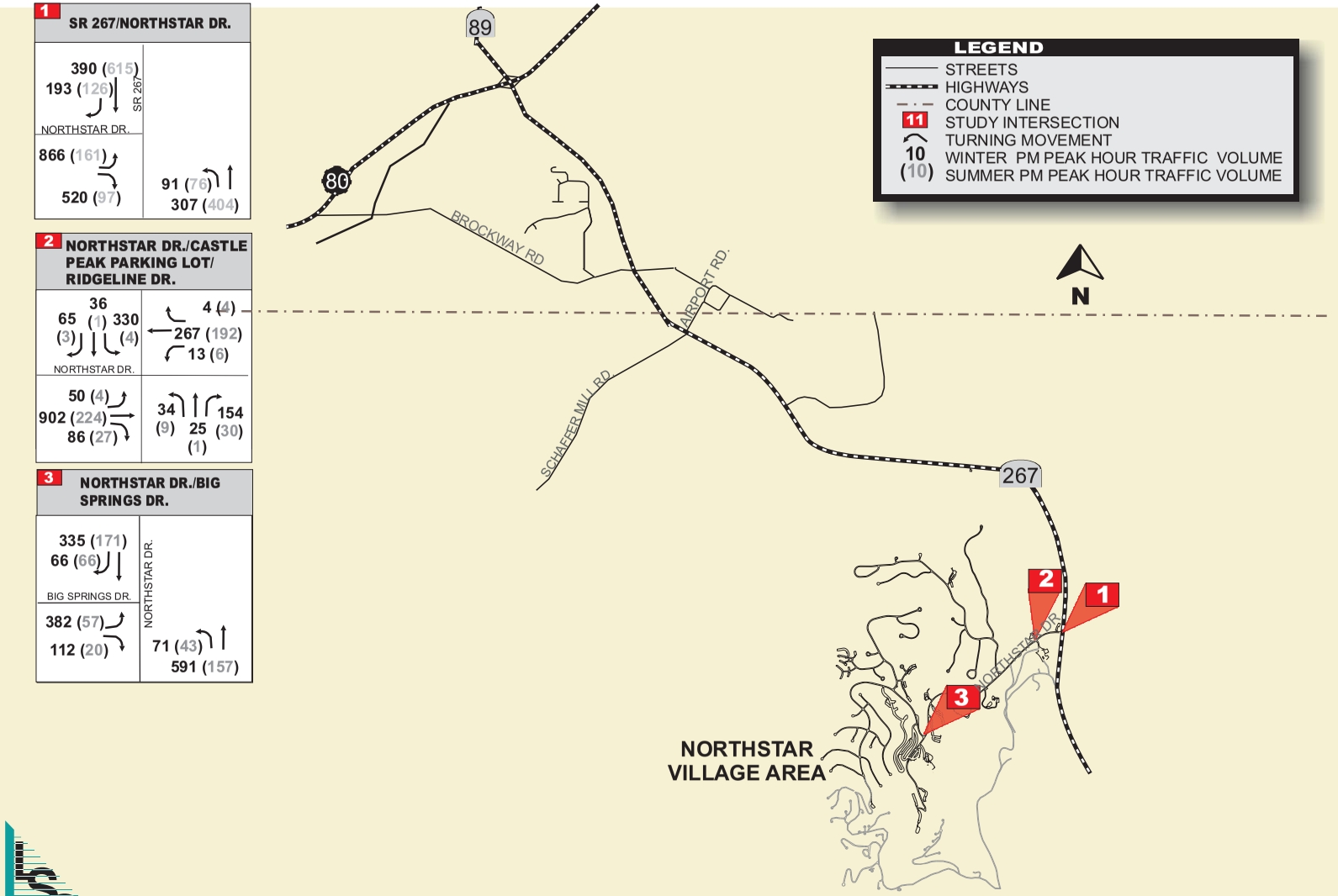


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TABLE 1: Northstar Mountain Master Plan - 2012 Roadway Volumes without Project

Roadway Study Segment		Jurisdiction	Unit	Design Volume	
				Summer	Winter
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	ADT	13,350	13,340
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	ADT	14,630	17,910
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	ADT	20,160	18,360
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	Peak Hour, Peak Direction/Lane	846	1,370
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	Peak Hour, Peak Direction/Lane	766	1,202
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot	Placer County	ADT	5,110	15,700
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	ADT	5,090	13,200

ADT = Average Daily Traffic

Source: LSC Transportation Consultants, Inc. *NorthstarMMP Sept2013.xlsx*

Based upon a review of Caltrans continuous hourly traffic count data for the entire summer of 2011 at a point on SR 267 just south of the intersection with Brockway Road/Soaring Way in the Town of Truckee, it was determined that the intersection counts conducted on August 12, 2011 reflect busy (but not absolute peak) summer PM peak-hour conditions. Therefore, the count data at the other two study intersections was adjusted to match the intersection that was counted on August 12, 2011.

Finally, a review of Caltrans traffic volumes along SR 267 at Postmile 3.76 (Northstar Drive) over the last 5 years shows that traffic has increased at an average annual rate of approximately 1.6 percent. This growth rate was applied to the 2011 volumes at the SR 267/Northstar Drive intersection to estimate 2012 traffic conditions. The existing 2012 summer PM peak-hour traffic volumes are shown in Figure 2.

For the roadway segment volumes, the existing peak-season ADT on each study roadway was estimated by applying a factor to the peak-hour volume on each roadway, as follows:

- ADT-to-peak hour factors for SR 267 for summer were estimated based on data obtained from the Caltrans permanent traffic trend station located at a point on SR 267 south of Brockway Road. Average ADT-to-peak hour factors were calculated for the summer (May through September) count period.

- The summer ADT-to-peak hour factor for Northstar Drive was estimated based on daily traffic count data collected during the summer of 2011.

The ADT–to-peak hour factors were then multiplied by the respective peak-hour roadway volumes to estimate the summer ADT on the study roadway segments, as shown in Table 1.

Existing Transit Services

There are a number of publicly operated or funded transit programs serving the Northstar area:

- The Northstar area is served by the hourly SR 267 Tahoe Area Regional Transit (TART) route, between 7:21 AM and 5:25 PM. This route provides hourly daytime service both to Truckee and to Kings Beach/Crystal Bay in the winter, as well as to Kings Beach/Crystal Bay in the summer.

- The Night Rider service operated through the Truckee – North Tahoe Transportation Management Association provides winter and summer evening service on an hourly basis from 6:30 PM to 1:30 AM.

- The North Lake Tahoe Express offers up to 9 runs a day connecting Northstar with the Reno-Tahoe International Airport.

In addition, Northstar California operates internal shuttles and regional skier shuttles, and also participates in public transit programs. Northstar provides the following transit incentives:

- Free TART bus tickets for all Northstar employees
- Free shuttles serving all Northstar resort parking lots
- Free shuttle to the residential neighborhoods along Northstar Drive between 8 AM and 10 PM daily during the ski season

- Free shuttle service between Sawmill Heights and the Village, departing every half hour between 6:30 AM and 6:40 PM daily during the ski season
- Once daily, free service skier shuttle between Hyatt in Incline Village, Kings Beach, and Tahoe Vista in the morning, and returning in reverse order at the end of the ski day

Northstar contracts with Old Greenwood to provide daily bus service between Old Greenwood and Northstar, December 16 through April 14. This route departs Old Greenwood three times in the morning, and departs Northstar three times in the afternoon.

Northstar partners with companies for bus and lift ticket packages from the Bay Area and Sacramento, with bus service provided by others.

Existing Traffic and Parking Management Plan

Northstar California Resort has a Traffic and Parking Management Plan that is implemented during winter operations. Overall management strategies are in place throughout the entire ski season, as well as specific management strategies that are employed and adjusted throughout the winter season depending on employee levels and total expected skier visits. On peak days, Northstar provides manual traffic control at the Northstar Drive/Big Springs Drive intersection and at the Northstar Drive roundabout. When peak days are experienced and onsite parking spaces reach capacity, Northstar notifies guests that parking is unavailable. A copy of the entire Plan is provided in Appendix B.

Existing Bicycle and Pedestrian Facilities

At present, there are no designated pedestrian/bicycle routes along the SR 267 corridor through the Martis Valley. Limited pedestrian activity occurs within the area due to the dispersed pattern of land use. Bicycle activity is also limited within the area, with the exception of summer recreational trips.

Martis Valley Trail

The planned Martis Valley Trail would provide Class I paved trail access between the Placer/Nevada County Line in Placer County and the Village at Northstar. The trail, at its northern terminus at the SR 267/Airport Road intersection, would connect to other trails proposed in the Town of Truckee. Two potential alignments were studied for the trail through Martis Valley. One alignment closely follows the alignment of SR 267 and the other follows Martis Creek and then ascends into the Northstar residential area. The Northstar Community Services District recently determined that the highway alignment is the more viable of the two alternatives. The trail is also planned to continue to the south of Northstar to the Fiberboard Freeway and into the Tahoe Basin. The Final EIR for the Martis Valley Trail was adopted in October of 2012. A construction date for the trail has not been scheduled.

Town of Truckee Trails and Bikeways

Truckee's existing trail and bikeway system includes recreational trails/Class I (separated) bike paths that are in place through the Truckee River Regional Park between Brockway Road and SR 267, east of SR 267 to the Riverview Sports Park, and in short sections north of the Pioneer Commerce Center, Gray's Crossing and Old Greenwood developments, along Brockway Road, and along Deerfield Drive. Class II bike lanes are also provided along Donner Pass Road

through the Gateway area. A Class I bike path is provided adjacent to The Rock retail center along the north side of Brockway Road, and additional trails/Class I bike paths will be built in conjunction with smaller development projects in the Brockway Road area.

Several other facilities are proposed in the 2002 Trails and Bikeways Master Plan, which describes a comprehensive system of bikeways located along Truckee's existing and future roadways, as well as a dedicated network of trails and pathways for use by pedestrians, equestrians, cyclists and cross-country skiers. The facilities proposed in the Master Plan include a major East-West Recreational Trail, Multi-User Recreational Trails, Class I Bike Paths, Class II Bike Lanes, and Class III Bike Routes.

Truckee North Tahoe Transportation Management Association

The Northstar California Resort and its development partners support the Truckee North Tahoe Transportation Management Association (TNT/TMA). The mission of the TNT/TMA is to foster public-private partnerships and resources for the advocacy and promotion of innovative solutions to the unique transportation challenges of the Truckee-North Lake Tahoe Resort Triangle. Northstar and its development partners have been members for many years.

The project location, the size of the project, and the time of the project completion are all important elements that need to be considered to determine the safety and capacity impacts of the development. It is also important to examine how the project will operate with the existing transportation system, estimate how much new traffic it will generate, identify how it would impact existing traffic patterns, and identify how traffic generated by the project site will be distributed.

PROJECT DESCRIPTION

The NMMP project identifies planned on-mountain improvements and infrastructure to accommodate these improvements, as well as other recreational components such as camping and relocation of cross-country ski facilities. The improvements are proposed to accommodate the recreational demands internal to Northstar. No dwelling or lodging units are proposed as a part of the NMMP. Although the proposed project is not intended to increase skier capacity, improvements to skier facilities would increase the overall employment and therefore the site trip generation during the winter. During the summer, the level of summer visitor activity would increase, as well as employment.

The proposed project includes various phases that will occur over a period of time. This study analyzes the following two levels of development: the “Project-Level” improvements, which are anticipated to be constructed in the near term, and the long-term “Program-Level” improvements, which are only conceptually designed at this time. The land use assumptions for both levels of development are summarized in Table 2.

TRIP GENERATION

The first step in the analysis of future traffic impacts is to prepare an estimate of the number of one-way vehicle-trips generated by the proposed project. Trip generation is the evaluation of the number of vehicle-trips that would either have an origin or destination at the project site.

Project-Level Trip Generation

The trip generation of the proposed Project-Level development during winter and summer conditions is estimated based upon the following conservative assumptions:

- A total of 69 additional Full Time Equivalent (FTE) employees (65 winter seasonal plus 4 year-round) are expected to be associated with the project. At present, approximately 32 percent of Northstar employees are part-time in the winter, and 28 percent in the summer. The number of forecast FTE employees is converted to the number of actual employees reporting to work on a peak day by applying these figures (assuming the average part-time employee works half time) and that 90 percent of all new employees report to work on a peak day. The resulting number of employees reporting to work on a peak winter day is calculated to be 72.

- The average vehicle occupancy rate for Northstar winter employees is estimated to be approximately 1.1 employees per vehicle, consistent with the assumptions in the *Environmental Impact Report: The Northside* (PMC, 2005).

TABLE 2: Northstar Mountain Master Plan - Winter and Summer Trip Generation Analysis

Proposed Land Uses	Quantity	Unit	Trip Generation Rates: Daily	PM Peak Hour: In	PM Peak Hour: Out	PM Peak Hour: Total	Percent Reduction for Non-Auto Trips	One-Way Vehicle Trips: Total Daily	PM Peak Hour: In	PM Peak Hour: Out	PM Peak Hour: Total
PROPOSED PROJECT-LEVEL DEVELOPMENT											
Winter											
Additional Employees (1)	72	Employees [2]	1.82	0.05	0.45	0.50	25%	98	3	24	27
Additional Public Services	3	Vehicles	2.00	0.67	0.67	1.34	0%	6	2	2	4
Total Winter Project Level								***104***	***5***	***26***	***31***
Summer											
Additional Employees (1)	4	Employees [3]	3.32	0.08	0.38	0.46	3%	13	1	1	2
Additional Public Services	1	Vehicle	2.00	0.67	0.67	1.34	0%	2	1	0	1
Total Summer Project Level								***15***	***2***	***1***	***3***
PROGRAM LEVEL DEVELOPMENT (Including Project Level Development)											
Winter											
Remote Campground at Mountain Top	50	Guests	n/a				0%	31	2	8	10
Additional Employees	112	Employees [2]	1.82	0.05	0.45	0.50	25%	153	4	38	42
Additional Public Services	4	Vehicles	2.00	0.67	0.67	1.34	0%	8	3	2	5
Subtotal - Winter Program Level Added Trips								***192***	***9***	***48***	***57***
Summer											
Campground at Relocated Cross-Country Center	50	Guests	n/a				0%	33	6	2	8
Remote Campground at Mountain Top	50	Guests	n/a				0%	31	2	8	10
Additional Employees	8	Employees [3]	3.32	0.08	0.38	0.46	3%	26	1	3	4
Additional Public Services	2	Vehicles	2.00	0.67	0.67	1.34	0%	4	1	2	3
Total Summer Program Level								***94***	***10***	***15***	***25***

Note 1: Number onsite on peak days, assuming that 32 percent of winter employees and 28 percent of summer employees are half-time (based on current Northstar staffing characteristics) and that 90 percent of all employees are on-site on a peak day.

Note 2: Winter employees are estimated to generate one daily round-trip with a vehicle occupancy of 1.1 employees per vehicle and half of employees will generate one trip during the PM peak hour.

Note 3: The trip generation rate for summer employees is based on the Institute of Transportation Engineers (ITE) Trip Generation, 8th Edition (2008) manual, "General Office" land use.

Source: LSC Transportation Consultants, Inc. *NorthstarMMP Sept2013.xlsx*

- The preponderance of employees will have day shifts, with a smaller proportion working evening/night shifts (such as snow grooming staff and cleaning staff). Of the day shift employees, many do not depart until after the peak hour of skier traffic. Based on observed employee work shift patterns at Tahoe-area resorts, 5 percent of the new employees are estimated to arrive during the PM peak hour, and 45 percent are estimated to depart during the PM peak hour.

- The trip generation of summer employees is estimated based upon standard Institute of Transportation Engineers (ITE) trip generation rates for the "General Office" land use.

- According to the project description, the project may result in additional demand for public services (such as utility trucks). Over the course of a busy winter day, three additional public service trips (round trips entering and exiting Northstar) are assumed to be generated, and one additional public service round-trip on a summer day.

Program-Level Assumptions

Under the Program-Level scenario, a total of 107 additional Full Time Equivalent (FTE) employees are expected in the winter (69 Project Level plus 37 additional winter seasonal plus 1 additional year-round), and 8 additional FTE employees in the summer (4 Project Level plus 3 summer seasonal plus 1 additional year-round). The resulting number of employees reporting to work on a peak winter day is approximately 112. A remote campground area would be located on the Backside, with access by snowcat in the winter and by van during the summer. No private vehicles would be used to access the site. The campground is anticipated to include group tents accommodating up to 50 guests. For the purposes of this analysis, the persons camping are assumed to arrive in the Northstar area by private auto. The vehicle occupancy for campground guests is assumed to be 3.47, based on the data from the TRPA regional travel model for visitor recreation trips. Over the course of a busy day, the entire group of 50 guests is assumed to depart and another group of 50 arrive. In addition, one additional service vehicle round-trip to the Northstar area (such as a fuel or supply vehicle) is assumed to be associated with the remote campground.

The existing cross-country ski center would be relocated to the west of Sawmill Reservoir, and a proposed summer campground in the same area would include group tents to accommodate up to 50 guests. A new 20-space parking lot is programmed for this location. The traffic that currently accesses the existing cross-country ski center via Northstar Drive is expected to instead access the new cross-country ski center via Highland View Road. The relocated cross-country ski center is not expected to impact overall trip generation during the winter, as the relocation would not impact the number of skiers, and as the 20 spaces that would become available in the day skier parking lots are assumed to be occupied by the additional Northstar employees. As such, no notable increase in day skier capacity is expected. During the summer, the trip generation of the proposed campground would be similar to that of the remote campground, except one additional utility vehicle round-trip is assumed (such as a trash truck or utility truck).

Finally, the Program-Level concept includes the Castle Peak parking lot transport gondola, which would transport people from the Castle Peak parking area to the Village. Currently, persons who park at the Castle Peak parking area travel to/from the Village via shuttle bus. The shuttle bus service would remain, with additional transport being provided by the proposed gondola. With implementation of the transport gondola, the number of buses making runs along Northstar Drive over the course of a typical busy day may potentially be reduced. However, to

remain conservative in this analysis, no reduction in traffic by the reduced number of shuttle bus trips is assumed.

Reduction for Non-Auto Modes

During the winter, some Northstar employees travel to/from Northstar via transit. Northstar employees average about 4 percent of the total ridership (based on a review of Northstar shuttle ridership data for 2010-2013 through January 10, 2013). Approximately 280 of the total 1,827 Northstar employees are estimated to ride the Northstar shuttles on a busy winter day, or approximately 15 percent of all employees. In addition, based upon a review of TART Resort Employee Ride Program data from the 2011-2012 and 2012-2013 (partial) winter seasons, about 180 employees are estimated to ride TART to/from Northstar on a busy winter day. Dividing 180 employees riding TART by a total of approximately 1,827 Northstar employees equates to about 10 percent of employees riding TART. Adding the portion of employees riding the Northstar shuttles (15 percent) to the those employees riding TART to/from Northstar (10 percent) yields a total of about 25 percent of Northstar employees traveling to/from Northstar via transit. This reduction is applied in the trip generation analysis, as shown in Table 2.

During the summer season, only about 1 percent of Northstar employees travel via transit, based on the TART Resort Employee Ride Program data. Overall, about 3 percent of Northstar employees are assumed to travel via non-auto modes in summer, including bicycle, walking, or transit.

Total Trip Generation

As indicated in Table 2, the Project-Level development is expected to result in an increase of approximately 104 daily one-way vehicle trips on a busy winter day, of which 31 (5 inbound and 26 outbound) would occur during the PM peak hour of skier-related traffic activity. On a busy summer day, the Project-Level development would result in an increase of approximately 15 daily one-way vehicle trips, of which 3 (2 inbound and 1 outbound) would occur during the PM peak hour.

The Program-Level improvements are expected to generate a higher level of trips than the Project Level, given that there would be additional employees and group camping areas. Conversely, implementation of the Castle Peak transport gondola could potentially result in a reduction in private automobile travel along Northstar Drive between the Castle Peak parking area and Northstar Village. The walk distance from the existing bus drop zone to the base lift area is roughly 750 feet. In comparison, the walk distance from the proposed gondola to the base lift area is about 340 feet, or less than half the distance than from the bus drop zone. The gondola could therefore be a more attractive option to some drivers who currently park in the Village parking lots, as it would eliminate their additional drive time along Northstar Drive to the Village lots and their time spent waiting for a shuttle in the Village lot or walking to the base lift area. As it would increase the attractiveness of the Castle Peak parking area, this would increase the volume of traffic entering the Castle Peak lots prior to the time when the Village lots are full, resulting in lower-peak-hour volumes along Northstar Drive on busy days. This would be a beneficial impact associated with the gondola.

The Program-Level development is expected to result in an increase of up to approximately 192 daily one-way vehicle trips on a busy winter day, of which 57 (9 inbound and 48 outbound) would occur during the PM peak hour of skier-related traffic activity. On a busy summer day, the

Program-Level development would result in an increase of approximately 94 daily one-way vehicle trips, of which 25 (10 inbound and 15 outbound) would occur during the PM peak hour. Note that these figures do not reflect the potential reduction in private automobile and shuttle bus travel along Northstar Drive between the Castle Peak parking area and the Village, as detailed information regarding the transport gondola operations is not available.

TRIP DISTRIBUTION AND ASSIGNMENT

The distribution of traffic arriving and departing the Northstar area is estimated based on existing turning movement patterns at the SR 267/Northstar Drive intersection and the location of the site relative to residential neighborhoods. The estimated distribution pattern for project-generated external trips during the winter and summer PM peak hours is approximately 65 percent north on SR 267, with the remaining 35 percent south on SR 267.

The assignment of project-generated traffic was conducted based upon the distribution patterns and the estimated parking locations. The resulting Project-Level-generated PM peak-hour traffic volumes through the study intersections are illustrated in Figure 3. Adding these volumes to the "existing without project" volumes yields the "existing with Project-Level" volumes shown in Figure 4. The Program-Level site-generated volumes are shown in Figure 5. Note that the Program Level volumes include the Project-Level volumes.

FIGURE 3

PROJECT-LEVEL SITE-GENERATED WINTER AND SUMMER INTERSECTION VOLUMES

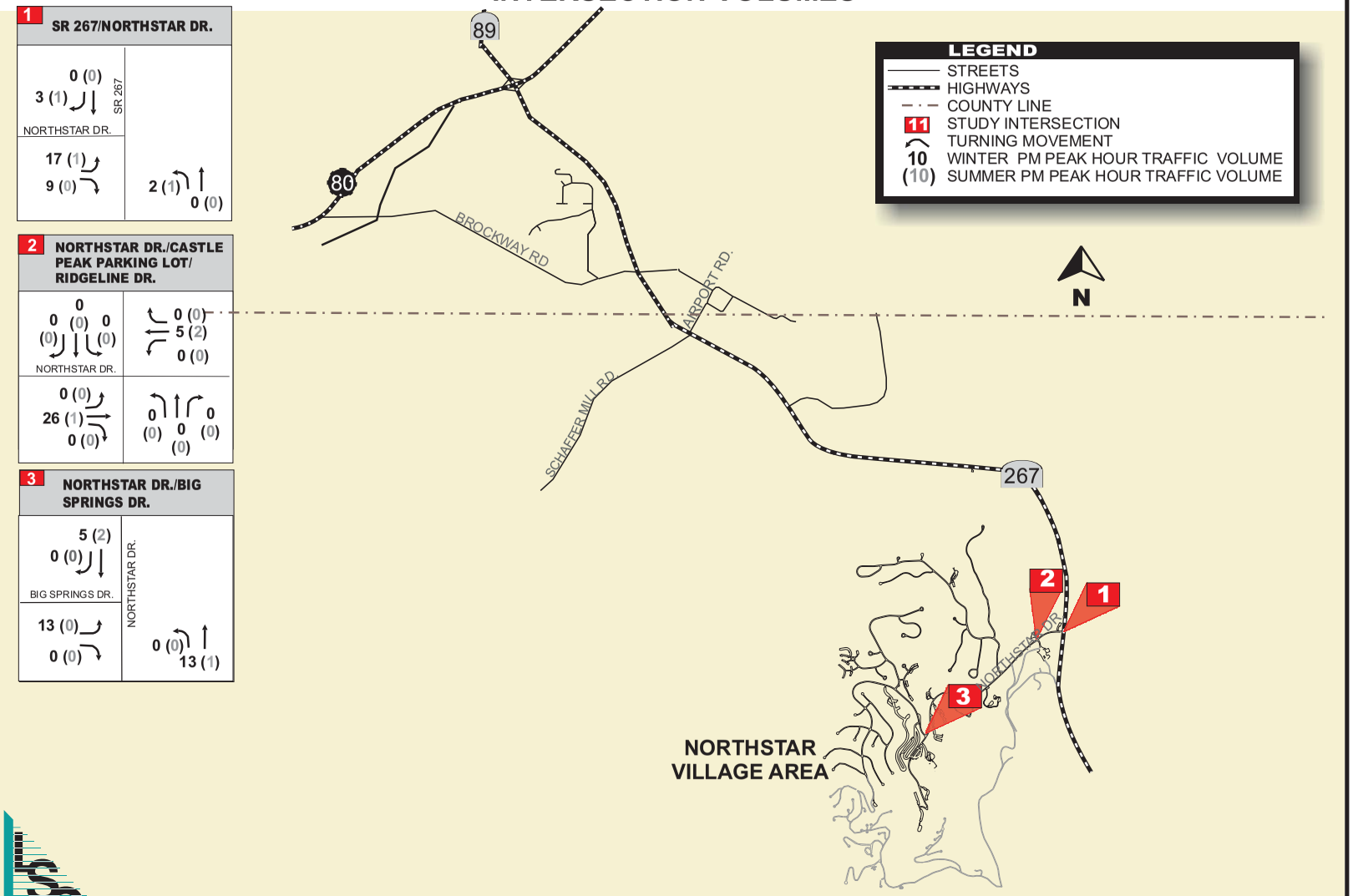


FIGURE 4

EXISTING WINTER AND SUMMER INTERSECTION VOLUMES WITH PROJECT-LEVEL IMPROVEMENTS

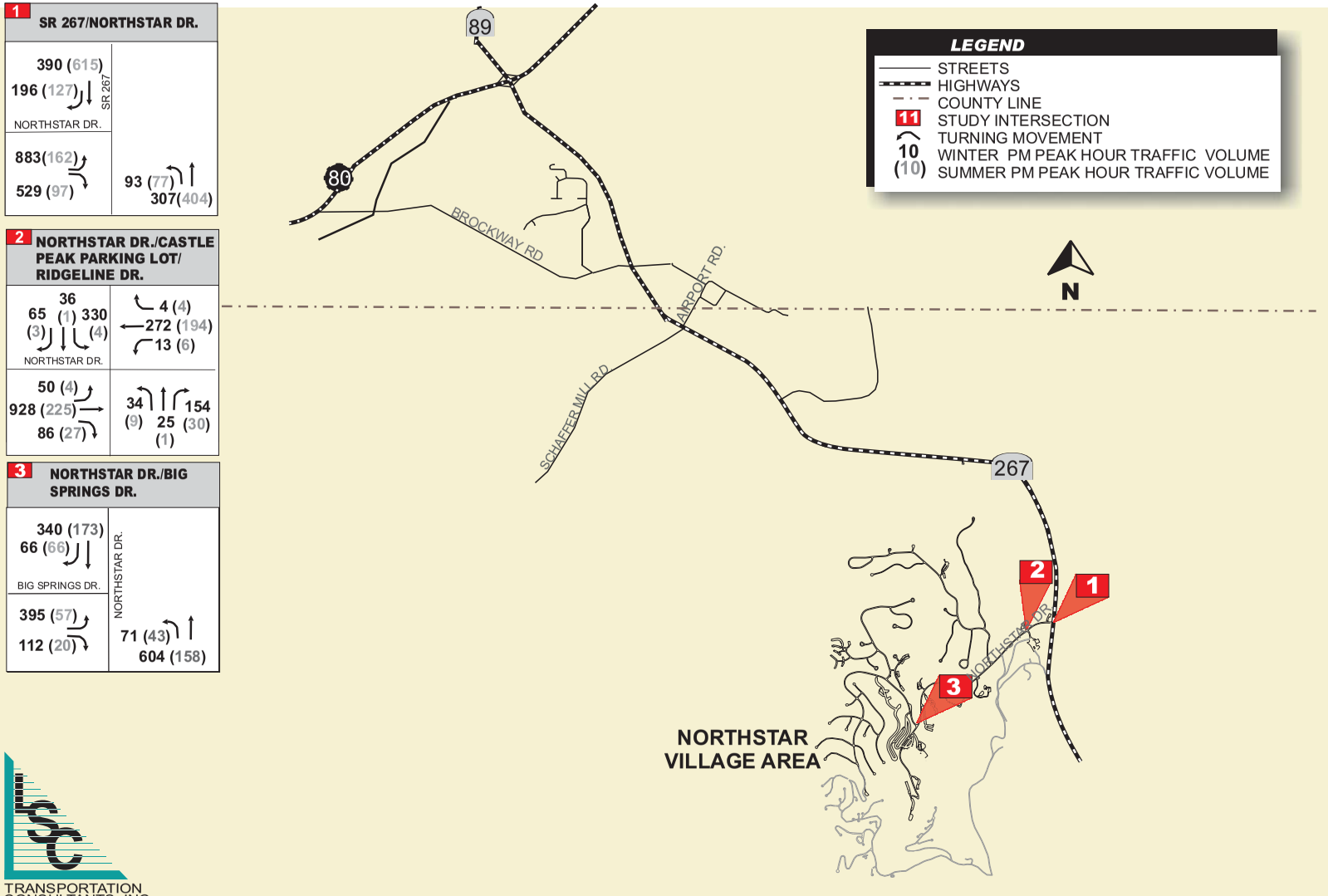
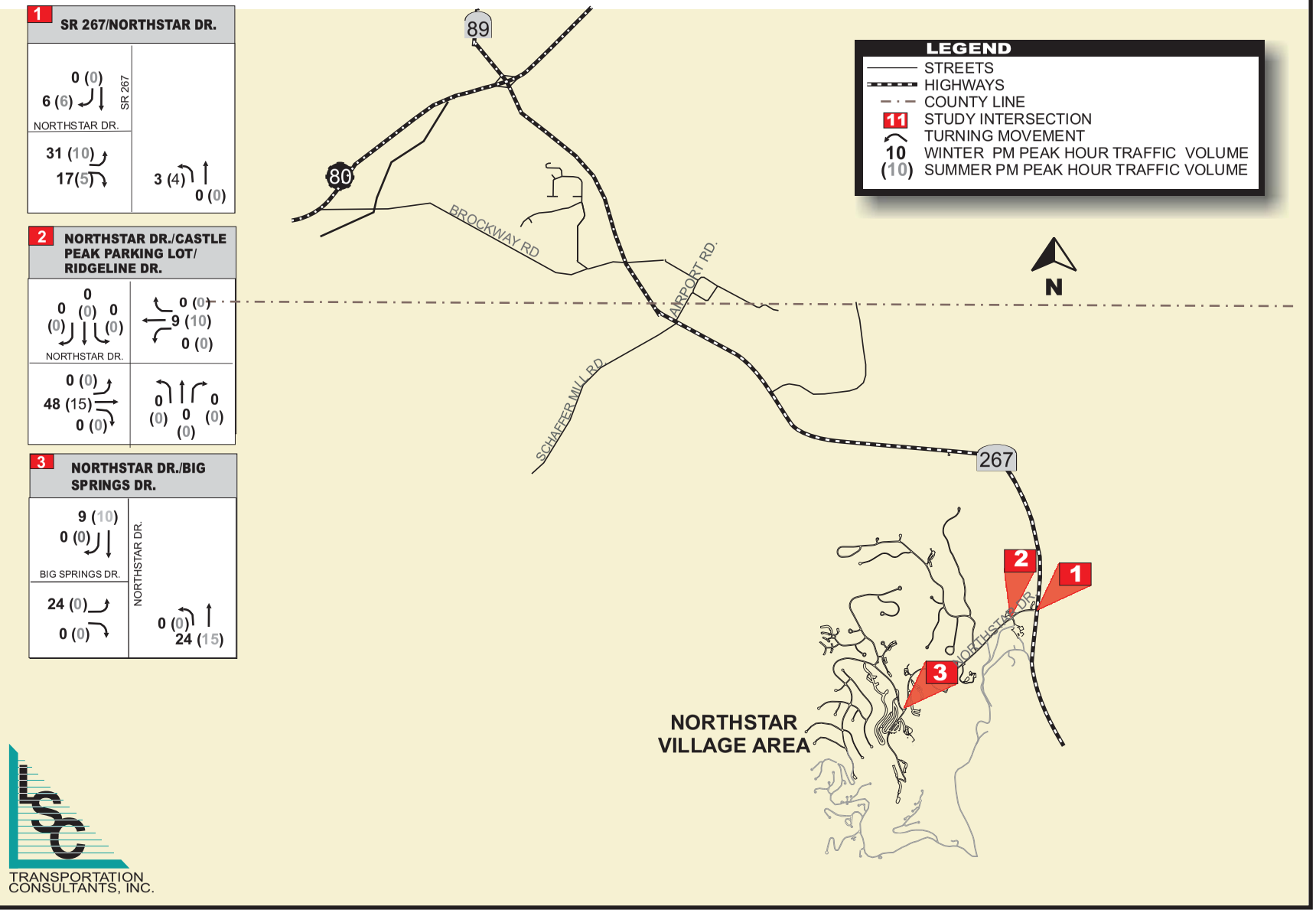


FIGURE 5

PROGRAM-LEVEL SITE-GENERATED WINTER AND SUMMER INTERSECTION VOLUMES



Section 4
FUTURE CUMULATIVE CONDITIONS

The potential transportation impacts of the NMMP Project are evaluated under long-term (20-year horizon) cumulative conditions. First, future cumulative traffic volumes are estimated without the project. Next, future cumulative volumes with the project are estimated. Finally, intersection LOS and roadway capacity are analyzed with and without the project.

FUTURE CUMULATIVE TRAFFIC VOLUMES

Future Winter Traffic Volumes

The future cumulative winter traffic volumes provided in *The Northside Draft Environmental Impact Report (EIR)* ('future plus project' scenario) are used as the basis for developing the long-term future cumulative winter volumes for this study. However, those volumes were estimated based upon the 2003 Martis Valley Community Plan. Subsequent to completion of the *Northside EIR*, changes were made to the approved land uses in Martis Valley. Specifically, several individual projects were approved with generally reduced levels of use. It is therefore necessary to adjust the winter traffic volume forecasts based on those changes. The volumes were adjusted using the following procedure:

1. The future summer peak-hour turning movement volumes from the Northside EIR ('future plus project' scenario) were compared to the future summer volume forecasts provided in the 2009 Town of Truckee TransCAD model (which does not include a winter scenario), which reflect updated land use assumptions in Martis Valley. For each roadway segment in this study, factors were calculated using the ratio of the corresponding directional roadway traffic volumes from the TransCAD model versus the traffic volumes from the Northside EIR. The resulting factors ranged from approximately 0.4 to 1.1.

2. It is necessary to apply the factors to only the portion of the traffic that is "non-skier traffic," given that the forecasted growth in "skier traffic" volumes has not changed since the Northside EIR was prepared. It is assumed that the ratio of summer to winter levels of non-skier traffic will remain constant in the future. The proportion of winter traffic that is skier traffic along SR 267 and through Northstar was evaluated in this analysis. The actual number of PM peak hour vehicles comprising skier traffic just west of SR 267 was obtained from the *Northstar-at-Tahoe Highlands Project Final PEA* (EDAW, August 4, 2003). These skier traffic volumes were then subtracted from the Northside EIR future winter traffic volumes to estimate the non-skier traffic volumes.

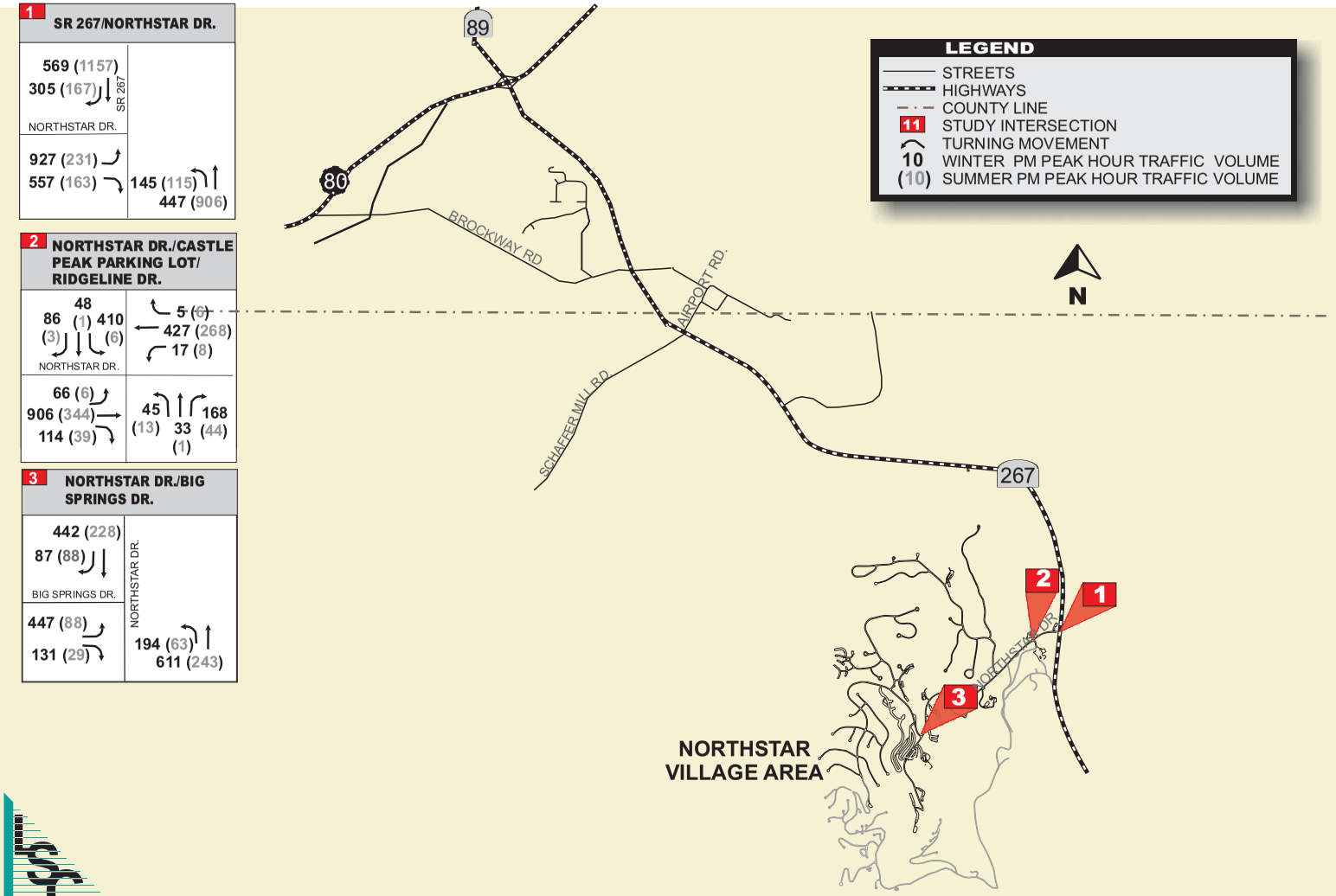
3. The adjustment factors were applied to the remaining non-skier traffic volumes, in order to reflect the recent changes in Martis Valley future land use assumptions.

4. The skier traffic volumes were added back to the above result to estimate the long-term future cumulative winter PM peak-hour traffic volumes.

The resulting 2032 winter PM peak-hour intersection turning movement volumes without the Northstar Mountain Master Plan Project are shown in Figure 6.

FIGURE 6

LONG-TERM (2032) CUMULATIVE WINTER AND SUMMER INTERSECTION VOLUMES WITHOUT PROJECT



Future Summer Traffic Volumes

Long-term future cumulative summer traffic volume forecasts are based on growth from the Town of Truckee's TransCAD traffic model. The Truckee TransCAD model provides forecasts of traffic conditions throughout the Town as well as the Martis Valley portion of Placer County. The model was most recently updated in 2009, and it reflects buildout of the Town's General Plan, buildout of the allowed land uses in the Martis Valley areas, and growth in traffic passing through the area. In the Truckee TransCAD traffic model, build-out of the Truckee General Plan is conservatively assumed to occur by 2030. For this analysis, no further growth in traffic is assumed between 2030 and 2032. This growth was added to the existing traffic volumes. The resulting 2032 summer weekday PM peak-hour intersection turning movement volumes without the Northstar Mountain Master Plan Project are shown in Figure 6.

Future summer roadway segment volumes were estimated based on the Town of Truckee TransCAD model. The growth in traffic between existing and future models was added to recent existing traffic counts along SR 267. No further adjustments to these volumes were necessary.

Future Traffic Volumes with Project

Adding the Project-Level project-generated turning movement volumes to the "without project" intersection volumes yields the "2032 with Project-Level Project" volumes shown in Figure 7. Similarly, adding the Program-Level-generated volumes to the "2032 without project" volumes yields the "2032 with Program-Level Project" volumes shown in Figure 8.

FIGURE 7

LONG-TERM (2032) CUMULATIVE WINTER AND SUMMER INTERSECTION VOLUMES WITH PROJECT LEVEL IMPROVEMENTS

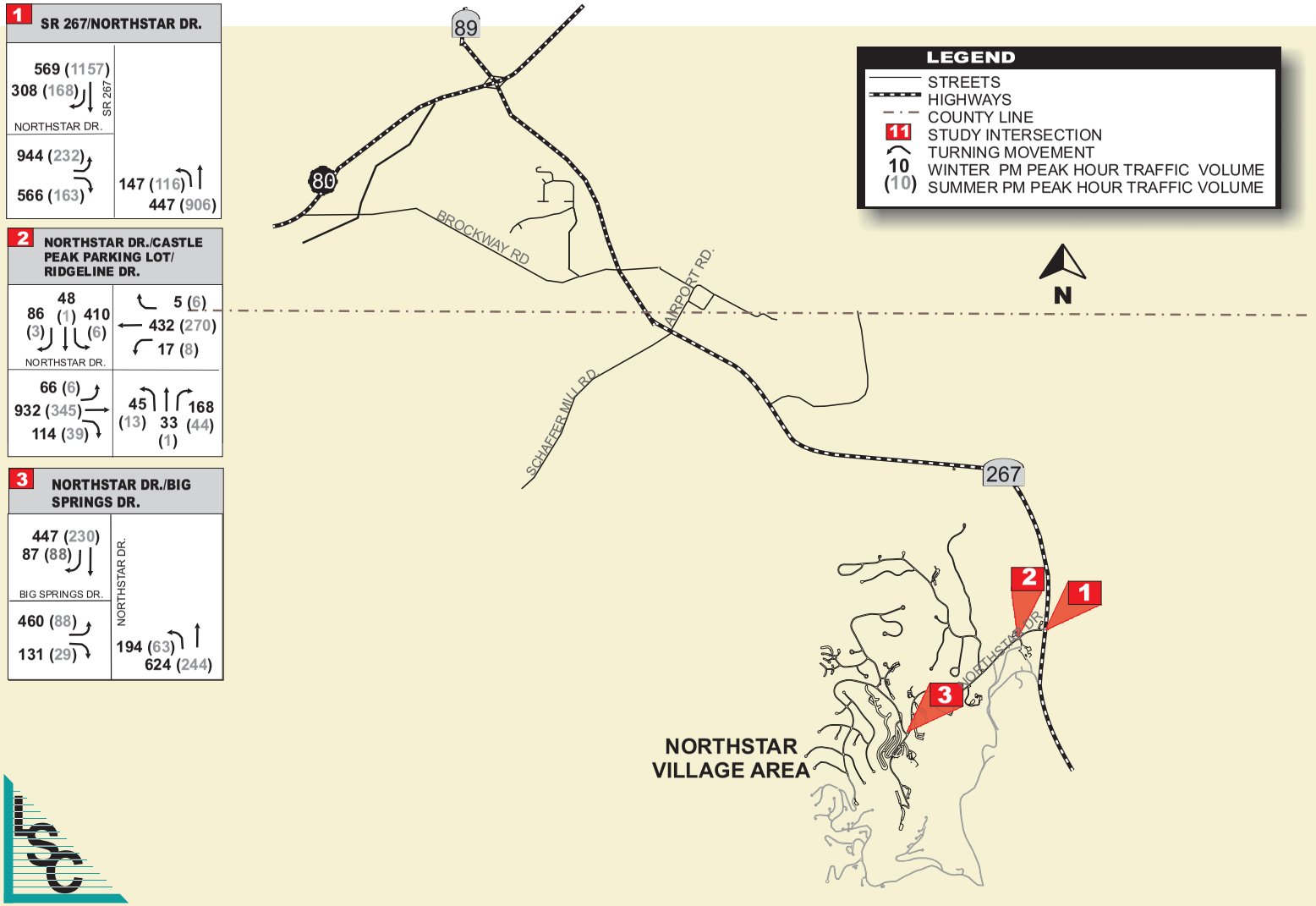
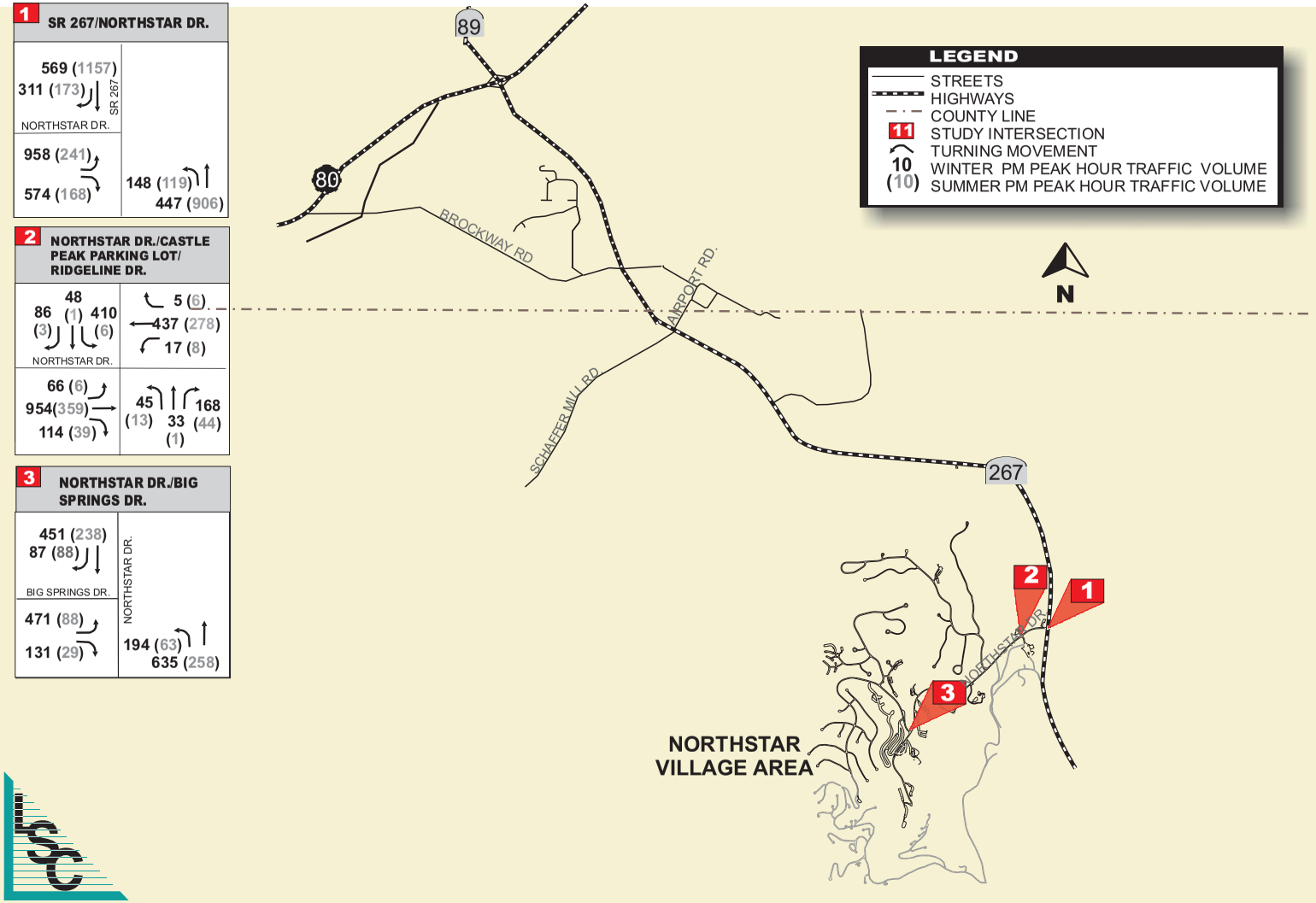


FIGURE 8

LONG-TERM (2032) CUMULATIVE WINTER AND SUMMER INTERSECTION VOLUMES WITH PROGRAM-LEVEL IMPROVEMENTS



Section 5
LEVEL OF SERVICE AND ROADWAY CAPACITY

DESCRIPTION

Traffic operations at the study intersections are assessed in terms of Level of Service (LOS) and delay. LOS is a concept that was developed by transportation engineers to quantify the level of operation of intersections and roadways (*Highway Capacity Manual*, Transportation Research Board, 2010). LOS measures are classified in grades "A" through "F," indicating the range of operation. LOS "A" signifies the best level of operation, while "F" represents the worst. A detailed description of LOS criteria is provided in Appendix C.

For signalized intersections, LOS is primarily measured in terms of average delay per vehicle entering the intersection. LOS at unsignalized intersections is quantified in terms of delay per vehicle for each movement. For purposes of this study, the LOS delay criteria for unsignalized intersections are assumed to be applicable to roundabouts on a worst movement basis. Unsignalized intersection LOS is based upon the theory of gap acceptance for side-street stop sign-controlled approaches, while signalized intersection LOS is based upon the assessment of volume-to-capacity ratios and control delay.

LEVEL OF SERVICE STANDARDS

The LOS thresholds applicable to the study area are discussed below.

Caltrans

According to the *SR 267 Transportation Corridor Concept Report* (Caltrans District 3, April, 2012), the minimum acceptable LOS along the entire length of SR 267 over the next 20 years is "D."

Placer County

Placer County defines its LOS standard as "D" for locations within one-half mile of a state highway, and "C" for other locations in the study area. Roadway LOS is measured according to ADT per travel lane, using a lookup table provided in the *Placer County Congestion Management Plan*. For the study area, Placer County requires evaluation of summer or winter ADT, whichever is higher. According to County policy, the County's LOS standards for the state highway system shall be no worse than those adopted in the Placer County Congestion Management Program (CMP). The LOS standard in the CMP for roadways and signalized intersections located along state highways is "E." If worst movement LOS at an unsignalized intersection in Placer County exceeds LOS standards, a "Peak-Hour" signal warrant analysis, consistent with the Manual of Uniform Traffic Control Devices (MUTCD), is required. If the intersection attains minimum signal warrant volumes, mitigation is required.

Placer County may allow exceptions to its LOS standards where it finds that the improvements or other measures required to achieve the LOS standards is unacceptable based on established criteria. In allowing any exceptions to established LOS standards, the County shall consider the following factors:

- The number of hours per day that the intersection or roadway segment would operate the conditions worse than the standard.

- The ability of the required improvement to significantly reduce peak-hour delay and improve traffic operations.

- The right-of-way needs and the physical impacts on surrounding properties.

- The visual aesthetics of the required improvement and its impact on community identity and character.

- Environmental impacts including air quality and noise impacts.

- Construction and right-of-way acquisition costs.

- The impacts on general safety.

- The impacts of the required construction phasing and traffic maintenance.

- The impacts on quality of life as perceived by residents.

- Consideration of other environmental, social or economic factors on which the County may base findings to allow exceedance of the standards.

Exceptions to the standards will only be allowed after all feasible measures and options are explored, including alternative forms of transportation.

Finally, Placer County recently adopted a "Methodology of Assessment – Minimum LOS" policy for County roadways and intersections (including State facilities) to ensure that mitigation measures are proportionate to the level of impact a specific project has on an intersection or roadway. The "Methodology of Assessment – Minimum LOS" clarification document is included in Appendix D. This methodology establishes guidelines for when a project may be considered to exceed the minimum LOS policies.

For roadway segments, *"a project may be considered to exceed the minimum LOS policies if:*

1. *A roadway segment operating at or above the established Placer County policy without the project will decrease to an unacceptable LOS with the project; or*

2. *A roadway segment currently operating below the applicable established policy will experience an increase in V/C (volume to capacity) ratio of 0.05 or greater; or*

3. *A roadway segment experiences an increase in ADT of 100 or more project generated trips, per lane, and the LOS policy is exceeded."*

For signalized intersections, *"a project may be considered to exceed the minimum LOS policies if:*

1. *An intersection operating at or above the established Placer County policy without the project will decrease to an unacceptable LOS with the project; or*

2. *An intersection currently operating below the acceptable LOS established policy will experience an increase in V/C (volume to capacity) ratio of 0.05 or greater; or*

3. *An intersection currently operating below the acceptable LOS policy will experience an increase in delay of 4 seconds or greater."*

For unsignalized intersections, *"a project may be considered to exceed the minimum LOS policies if:*

1. *An unsignalized intersection which currently operates at or above the established Placer County policies without the project will deteriorate to an unacceptable LOS with the project; or*

2. *An unsignalized intersection which currently operates below the acceptable LOS established policy will experience an increase of 2.5 seconds or more with the project.*

Further consideration will be given in situations where the existing level of service is just above or at the approved minimum level of service and any increase in vehicle trips, or even daily fluctuations in traffic, will deteriorate the level of service to an unacceptable level. In such cases, it may be determined by the County that part (2) or (3) of the above exceptions is more applicable and should be used to analyze a proposed project's impacts."

Martis Valley Community Plan

The adopted *Martis Valley Community Plan* (Placer County, 2003) specifies that the County shall develop and manage its roadway system to maintain the following minimum levels of service (LOS):

- LOS "C" on rural roadways, except within one-half mile of state highways where the standard shall be LOS "D."

- LOS "C" on urban/suburban roadways except within one-half mile of state highways where the standards shall be LOS "D."

It also states that the County's LOS standard for SR 267 shall be no worse than "E."

Town of Truckee

The existing Town of Truckee policy on LOS is applied in this Traffic Impact Analysis. As stated in the *Truckee 2025 General Plan*, the Town's LOS standards are as follows:

> *"Policy P2.1 – Establish and maintain a Level of Service D or better on road segments and for total intersection movements in portions of the Town outside of the Downtown Study Area". Establish and maintain a Level of Service E or better on arterial and collector road segments and for total intersection movements within the Downtown Specific Plan Area. Throughout the Town, individual turning movements at unsignalized intersections shall not be allowed to reach LOS F and to exceed a cumulative vehicle delay of four vehicle hours. Both of these conditions shall be met for traffic operations to be considered unacceptable."*

As the study roadway segments in this study are outside the downtown Truckee area, the LOS D standard is applied to the segments in Truckee. The segments of SR 267 located in Placer County are measured against the Caltrans standard of LOS D, as Placer County typically defers to Caltrans LOS standards on State facilities.

ANALYSIS METHODOLOGY

Intersection LOS for the study intersections is largely evaluated using the methodologies documented in the 2010 *Highway Capacity Manual* (HCM), as applied in the Synchro software package. Computer output of detailed LOS calculations for all intersections is provided in Appendix E of this report.

INTERSECTION LEVEL OF SERVICE ANALYSIS

All study intersections were evaluated to determine existing operational conditions for the 2012 winter and summer PM peak hours, with and without the proposed project.

SR 267/Northstar Drive Intersection

As indicated in Table 3, the signalized SR 267/Northstar Drive intersection operates at an acceptable LOS (LOS C or better) during the winter and summer PM peak hours, with or without the proposed project.

Northstar Drive/Castle Peak Parking Access/Ridgeline Drive Roundabout

For the purposes of this analysis, the Northstar Drive roundabout is modeled as a single-lane roundabout for summer conditions. During peak winter AM and PM conditions, Northstar has the option of optimizing the performance of the intersection by coning special lane configurations. The 30-foot circulating lane provides sufficient width for the roundabout to operate as a dual-lane roundabout. During peak AM conditions the westbound lane is coned to be a dual approach lane. The right westbound lane becomes a right-turn bypass lane which feeds directly into the Castle Peak parking lot, while the left lane services thru and left-turning vehicles. During peak PM conditions the outgoing eastbound leg is coned into two lanes. Dual approach and departure lanes allow for an increased number of eastbound vehicles to egress through the intersection.

Traffic control personnel are on site during peak periods to aide buses making an eastbound left-turn movement, as they require the full 30-foot width in order to perform the turning maneuver. Traffic control personnel also aide those leaving the Castle Peak parking area and making a southbound left turn into the flow of traffic. The gaps created for the southbound left also benefits those waiting to make a northbound right turn onto Northstar Drive.

Because of the actions of the traffic control personnel, the intersection can perform better than the Synchro model predicts. Turning movements which are hindered by the large volume of eastbound through traveling vehicles are aided by traffic controls which are not incorporated into the roundabout model. Much like traffic signal timing at an actuated signal can shift to minimize overall delay, the traffic control personnel manage traffic at this roundabout to aid overall traffic flow. Thus, the overall intersection delay and LOS should be used as a gauge of intersection performance, rather than the worst approach.

As shown in the table, the Northstar Drive/Castle Peak Parking Access/Ridgeline Drive roundabout operates at an acceptable LOS, so long as a Traffic Control Officer is provided during busy winter periods. Implementation of the Project-Level improvements would slightly increase the average delays at this intersection, although the LOS would not be affected. Note

TABLE 3: Northstar MMP 2012 Intersection Level of Service

Intersection	Control Type	No Project				With Project Level			
		Total Intersection		Worst Movement		Total Intersection		Worst Movement	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Summer PM Peak-Hour									
Northstar Dr./SR 267	Signalized	10.9	B	--	--	10.9	B	--	--
Northstar Dr./Castle Peak Parking lot [1]	Roundabout	4.6	A	4.8	A	4.6	A	4.8	A
Northstar Dr./Big Springs	All-Way Stop	8.9	A	9.1	A	9.0	A	9.1	A
Winter PM Peak-Hour									
Northstar Dr./SR 267	Signalized	29.9	C	--	--	31.6	C	--	--
Northstar Dr./Castle Peak Parking lot [2]	Roundabout	11.1	B	19.0	C	11.4	B	19.7	C
Northstar Dr./Big Springs [3]	TCO [4]	23.3	C	--	--	23.6	C	--	--

Note 1: Analysis assumes single-lane roundabout with single lane approaches.

Note 2: Analysis assumes roundabout is coned to provide dual entry and circulating lanes for eastbound traffic.

Note 3: Winter analysis of Northstar Drive/Big Springs Drive intersection assumes operations with a Traffic Control Officer (TCO).

Note 4: TCO operation is estimated using a signalized intersection analysis with a protected northbound left-turn and a 90-second cycle length.

Source: LSC Transportation Consultants, Inc. *Northstar MMP Sept2013.xlsx*

that Northstar's Traffic Management Plan includes provision of traffic control personnel during peak winter periods.

Northstar Drive/Big Springs Drive Intersection

The Northstar Drive/Big Springs Drive intersection operates at an acceptable LOS in 2012, with or without the project, so long as a Traffic Control Officer is provided during busy winter periods. Note that Northstar's Traffic Management Plan includes provision of traffic control personnel during peak winter periods.

Long-Term Future Intersection Level of Service

Study intersections are evaluated to determine operational conditions under 2032 traffic volumes, with and without the project. Table 4 summarizes the results for future 2032 conditions with and without the project.

SR 267/Northstar Drive Intersection

In comparison with existing 2012 conditions, the LOS at the SR 267/Northstar Drive intersection is expected to degrade by one level in the future, due to growth in background traffic. However, this intersection would continue to operate at an acceptable LOS. Implementation of the proposed project (Project Level or Program Level) would not affect the LOS, although the total intersection delay would increase slightly during the summer (less than 1 second per vehicle) and by a few seconds (up to 4.4 seconds per vehicle) during winter peak periods. No intersection LOS deficiencies are identified with the proposed project.

Northstar Drive/Castle Peak Parking Access/Ridgeline Drive Roundabout

The future cumulative 2032 analysis assumes implementation of the ultimate roundabout improvements described in the *Northstar Drive/Ridgeline Drive Roundabout Review* (Reid Middleton September 8, 2011). With these improvements, the roundabout is assumed to operate as a dual-lane roundabout. Two entering lanes are assumed on each approach. The east and west legs are assumed to have two exiting lanes, and the north and south legs are assumed to have one exiting lane. In comparison with existing 2012 conditions, the LOS is not expected to degrade at this intersection in the future, so long as traffic control continues to be provided during peak winter periods. Implementation of the proposed project (Project Level or Program Level) would not affect the LOS at the roundabout, although it would generally result in a slight increase in average delays (an increase of less than 1 second per vehicle). No intersection LOS deficiencies are identified with the proposed project.

Northstar Drive/Big Springs Drive Intersection

In comparison with existing 2012 conditions, the LOS is expected to degrade by one level (LOS A to LOS B) during summer peak periods in the future, due to growth in background traffic. The LOS during winter peak periods is not expected to degrade, so long as traffic control continues to be provided. Implementation of the proposed project (Project Level or Program Level) would not affect the LOS at this intersection, although it would generally result in a slight increase in average delays (an increase of less than 1 second per vehicle). No intersection LOS deficiencies are identified with the proposed project.

TABLE 4: Northstar MMP 2032 Intersection Level of Service

Intersection	Control Type	No Project				With Project Level				With Program Level			
		Total Intersection		Worst Movement		Total Intersection		Worst Movement		Total Intersection		Worst Movement	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Summer PM Peak-Hour													
Northstar Dr./SR 267	Signalized	30.4	C	--	--	30.5	C	--	--	31.3	C	--	--
Northstar Dr./Castle Peak Parking lot [1]	Roundabout	4.1	A	4.4	A	4.1	A	4.4	A	4.1	A	4.4	A
Northstar Dr./Big Springs	All-Way Stop	10.5	B	10.9	B	10.5	B	10.9	B	10.7	B	11.1	B
Winter PM Peak-Hour													
Northstar Dr./SR 267	Signalized	42.1	D	--	--	45.1	D	--	--	47.0	D	--	--
Northstar Dr./Castle Peak Parking lot [1]	Roundabout	11.2	B	16.0	C	11.5	B	16.7	C	11.9	B	17.3	C
Northstar Dr./Big Springs [2]	TCO [3]	30.1	C	--	--	30.9	C	--	--	31.4	C	--	--

Note 1: Analysis assumes dual-lane roundabout with dual-lane approaches on all legs and single-lane departures for north and south legs.

Note 2: Winter analysis of Northstar Drive/Big Springs Drive intersection assumes operations with a Traffic Control Officer (TCO).

Note 3: TCO operation is estimated using a signalized intersection analysis with a protected northbound left-turn and a 90-second cycle length.

Source: LSC Transportation Consultants, Inc. *Northstar MMP Sept2013.xlsx*

INTERSECTION QUEUING ANALYSIS

Traffic queues at specific intersections that exceed the storage capacity of turn lanes or ramps, or that block turn movements at important nearby intersections or driveways can cause operational problems beyond those identified in the LOS analysis. The 95th-percentile traffic queue length (the length that is only exceeded 5 percent of the time during the analysis period) was reviewed at locations where queuing could potentially cause traffic problems. Specifically, the potential for queuing problems along Northstar Drive between the Castle Peak/Ridgeline Drive roundabout and the SR 267 signal was evaluated.

Traffic Queues at SR 267/Northstar Drive Intersection

Exclusive turn lanes are provided along SR 267 for northbound left-turns and southbound right-turns onto Northstar Drive. The northbound left-turn lane provides approximately 435 feet of vehicle storage. The southbound right-turn lane provides 285 feet of vehicle storage. The eastbound Northstar Drive approach to SR 267 provides two left-turn lanes and one right-turn lane. The roadway provides adequate width for a three-lane approach to the intersection for about 300 feet. Based upon a review of the 95th-percentile calculated queues on these movements, the storage capacity of these turn lanes is not expected to be exceeded under any existing or future scenarios. Furthermore, the segment of Northstar Drive between the Castle Peak/Ridgeline Drive roundabout and SR 267 is approximately 800 feet long. The existing 95th-percentile traffic queue length along eastbound Northstar Drive approaching SR 267 is calculated to be approximately 218 feet in the winter PM peak hour and 46 feet in the summer PM peak hour. Therefore, ample storage length is provided in 2012. A summary of intersection queue lengths both with and without the proposed project for the 2012 analysis year is provided in Table 5.

Implementation of the Project-Level improvements in 2012 would result in a minimal increase in the queue lengths at this intersection. Therefore, no traffic queuing concerns are identified in 2012.

Traffic Queues at Northstar Drive Roundabout

The 95th-percentile queue length along westbound Northstar Drive approaching the Castle Peak/Ridgeline Drive roundabout is calculated to be approximately 25 feet in the winter and summer PM peak hours, with or without the project. During the winter, a traffic control officer (TCO) provides traffic control at the roundabout during peak times. It is assumed that the TCO control would provide westbound phasing appropriate to the demand in real time. As about 780 feet of storage length is provided, it is assumed that any queue formed by westbound traffic would not impede traffic operations on the highway. Therefore, no traffic queuing concerns are identified in 2012, with or without the project.

Future Cumulative Intersection Queuing Analysis

The long-term future forecasted 95th-percentile traffic queue lengths along Northstar Drive at the eastbound approach to SR 267 are approximately 238, 286, and 292 feet in the winter PM peak hours without the project, with Project-Level development, and with Program-Level development, respectively. During the summer PM peak hour, this queue length is calculated to be approximately 100 feet, with or without the project. The long-term future forecasted 95th-percentile queue length along Northstar Drive at the westbound approach to the Castle

TABLE 5: Northstar MMP 2012 Intersection Queuing

Intersection	Approach	Storage Length (feet)	95th-Percentile Queue Length Vs. Storage Length: No Project Queue Length (feet)	No Project Queue Exceeds Storage?	With Project Level Queue Length (feet)	With Project Level Queue Exceeds Storage?
Summer PM Peak-Hour						
Northstar Dr./Castle Peak Parking lot	Westbound	780	25	No	25	No
Northstar Dr./SR 267	Eastbound	780	46	No	46	No
	Northbound Left-Turn	435	79	No	81	No
	Southbound Right-Turn	285	19	No	19	No
	Eastbound Right-Turn [1]	300	32	No	32	No
Winter PM Peak-Hour						
Northstar Dr./Castle Peak Parking lot	Westbound	780	25	No	25	No
Northstar Dr./SR 267	Eastbound	780	218	No	224	No
	Northbound Left-Turn	435	82	No	83	No
	Southbound Right-Turn	285	35	No	35	No
	Eastbound Right-Turn [1]	300	133	No	146	No

Note 1: Synchro's interpretation of HCM 2010 methodology does not allow for the analysis of right-turn overlap phasing. This intersection was analyzed assuming no overlap phasing; therefore, actual queue lengths would be less than reported.

Source: LSC Transportation Consultants, Inc. *Northstar MMP Sept2013.xlsx*

Peak/Ridgeline Drive roundabout is approximately 25 feet in the winter PM peak hour, with or without the project, and negligible in the summer PM peak hour. In summary, intersection traffic queuing is not expected to cause any traffic concerns at any of the study intersections under Year 2032 conditions, with or without the project. A summary of intersection queue lengths both with and without the proposed project for the 2032 analysis year is provided in Table 6.

ROADWAY CAPACITY

Roadway capacity is evaluated in order to determine whether a specific roadway segment should be widened to accommodate existing or future traffic volumes. Different methodologies can be employed to determine capacity, but generally, the calculation will incorporate a series of factors including roadway facility type, evaluation period, and level of service thresholds. The roadway LOS was determined by applying the Placer County or Town of Truckee standard to the Average Daily Traffic volume (ADT) or peak-hour, peak-directional traffic volumes on each roadway, respectively. Placer County policy on roadway LOS defers to the Caltrans concept LOS standard for state highways. Therefore, the roadway LOS for SR 267 is evaluated against the Caltrans LOS standard of LOS D.

The maximum allowable traffic volumes to obtain the LOS thresholds applicable to the study roadway segments are shown in Table 7, and the resulting LOS for each roadway is summarized in Table 8. For the purposes of this analysis, the segment of Northstar Drive between the roundabout and SR 267 is assumed to have a 3-lane cross section, with two lanes provided in the peak direction during the winter season (westbound in the morning and eastbound in the afternoon).

TABLE 6: Northstar MMP 2032 Intersection Queuing

Intersection	Approach	Storage Length (feet)	95th-Percentile Queue Length Vs. Storage Length: No Project — Queue Length (feet)	No Project — Queue Exceeds Storage?	With Project Level — Queue Length (feet)	With Project Level — Queue Exceeds Storage?	With Program Level — Queue Length (feet)	With Program Level — Queue Exceeds Storage?
Summer PM Peak-Hour								
Northstar Dr./Castle Peak Parking lot	Westbound	780	0	No	0	No	0	No
Northstar Dr./SR 267	Eastbound	780	99	No	100	No	102	No
	Northbound Left-Turn	435	179	No	181	No	186	No
	Southbound Right-Turn	285	22	No	21	No	22	No
	Eastbound Right-Turn [1]	300	54	No	54	No	55	No
Winter PM Peak-Hour								
Northstar Dr./Castle Peak Parking lot	Westbound	780	25	No	25	No	25	No
Northstar Dr./SR 267	Eastbound	780	238	No	286	No	292	No
	Northbound Left-Turn	435	131	No	151	No	152	No
	Southbound Right-Turn	285	41	No	42	No	42	No
	Eastbound Right-Turn [1]	300	223	No	257	No	265	No

Note 1: Synchro's interpretation of HCM 2010 methodology does not allow for the analysis of right-turn overlap phasing.
This intersection was analyzed assuming no overlap phasing; therefore, actual queue lengths would be less than reported.

Source: LSC Transportation Consultants, Inc. *Northstar MMP Sept2013.xlsx*

TABLE 7: Northstar Mountain Master Plan - Roadway Level of Service Standards

Roadway Study Segment		Jurisdiction	LOS Standard	Unit	Roadway Class	Threshold Volume
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	Rural Highway - Rolling	11,400
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	Rural Highway - Level	15,500
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	Rural Highway - Level	15,500
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	Highway/Major Arterial	1,891
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	Highway/Major Arterial	1,891
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	Arterial - Moderate	24,300
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	Arterial - Moderate	14,400

Note 1: During peak periods, a 3-lane cross section is assumed on Northstar Drive between SR 267 and the roundabout.

Source: LSC Transportation Consultants, Inc. *NorthstarMMP Sept2013.xlsx*

As shown in Table 8, the following study roadway segments currently exceed Caltrans' concept LOS (LOS D):

- SR 267 between Brockway Summit and Northstar Drive - **summer and winter**
- SR 267 between Northstar Drive and Airport Road - **winter only**
- SR 267 between Airport Road and Placer/Nevada County Line - **summer and winter**

All remaining study roadway segments currently operate within the applicable LOS thresholds. The 2012 roadway LOS with the Project-Level improvements is summarized in Table 9. Although the proposed project would increase traffic volumes, it would not cause any additional roadway segments to exceed the LOS thresholds. Furthermore, for the study roadway segments that are operating below the applicable LOS threshold, the project would result in an increase in V/C ratio of up to 0.01 and no study segments would experience an increase in ADT of 100 or more trips per lane. As such, the project would not exceed the County's minimum LOS policies at any study roadway location in 2012.

Long-Term Future Cumulative Roadway Capacity

Table 10 presents a comparison of future cumulative 2032 'no project' roadway volumes to the pertinent standards. The ADT volumes for 2032 conditions were estimated using the same methodology as the 2012 volumes. As shown under 2032 conditions, the following study roadway segments are expected to exceed Caltrans' concept LOS (LOS D):

- SR 267 between Brockway Summit and Northstar Drive - **summer and winter**
- SR 267 between Northstar Drive and Airport Road – **summer and winter**
- SR 267 between Airport Road and Placer/Nevada County Line - **summer and winter**

Additionally, the following Placer County study segment would exceed the County's LOS threshold:

- Northstar Drive between roundabout and Big Springs Drive – **winter only**

As shown in Tables 11 and 12, implementation of the project (Project Level and Program Level, respectively) is not expected to cause any additional roadway segments to exceed the applicable thresholds. Furthermore, for the study roadway segments that are operating below the applicable LOS thresholds, the project would result in an increase in V/C ratio of up to 0.02 and no study segments would experience an increase in ADT of 100 or more trips per lane. Consequently, the project (at any development level) would not exceed the County's minimum LOS policies at any study roadway location in 2032.

TABLE 8: Northstar Mountain Master Plan - 2012 Roadway Level of Service without Project

Roadway Study Segment		Jurisdiction	LOS Standard	Unit	Threshold Volume	Design Volume	Deficient?	V/C Ratio
Summer								
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	11,400	**13,350**	**YES**	1.17
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	15,500	14,630	No	0.94
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	15,500	**20,160**	**YES**	1.30
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	846	No	0.45
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	766	No	0.41
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	24,300	5,110	No	0.21
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	14,400	5,090	No	0.35
Winter								
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	11,400	**13,340**	**YES**	1.17
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	15,500	**17,910**	**YES**	1.16
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	15,500	**18,360**	**YES**	1.18
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,370	No	0.72
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,202	No	0.64
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	24,300	15,700	No	0.65
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	14,400	13,200	No	0.92

Note: V/C Ratio = Volume-to-Capacity Ratio.

Note 1: During peak periods, a 3-lane cross section is assumed on Northstar Drive between SR 267 and the roundabout.

Source: LSC Transportation Consultants, Inc. *NorthstarMMP Sept2013.xlsx*

TABLE 9: Northstar Mountain Master Plan - 2012 Roadway Level of Service with Project-Level Development

Roadway Study Segment		Jurisdiction	LOS Standard	Unit	Threshold Volume	Design Volume	Deficient?	V/C Ratio
Summer								
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	11,400	**13,355**	**YES**	1.17
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	15,500	14,640	No	0.94
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	15,500	**20,170**	**YES**	1.30
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	848	No	0.45
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	768	No	0.41
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	24,300	5,125	No	0.21
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	14,400	5,105	No	0.35
Winter								
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	11,400	**13,376**	**YES**	1.17
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	15,500	**17,978**	**YES**	1.16
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	15,500	**18,428**	**YES**	1.19
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,390	No	0.74
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,222	No	0.65
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	24,300	15,804	No	0.65
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	14,400	13,304	No	0.92

Note: V/C Ratio = Volume-to-Capacity Ratio.

Note 1: During peak periods, a 3-lane cross section is assumed on Northstar Drive between SR 267 and the roundabout.

Source: LSC Transportation Consultants, Inc. *NorthstarMMP Sept2013.xlsx*

TABLE 10: Northstar Mountain Master Plan - 2032 Roadway Level of Service without Project

Roadway Study Segment		Jurisdiction	LOS Standard	Unit	Threshold Volume	Design Volume	Deficient?	V/C Ratio
Summer								
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	11,400	**26,220**	**YES**	2.30
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	15,500	**27,560**	**YES**	1.78
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	15,500	**31,720**	**YES**	2.05
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,567	No	0.83
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,330	No	0.70
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	24,300	7,500	No	0.31
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	14,400	7,470	No	0.52
Winter								
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	11,400	**17,520**	**YES**	1.54
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	15,500	**23,390**	**YES**	1.51
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	15,500	**27,610**	**YES**	1.78
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,653	No	0.87
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,394	No	0.74
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	24,300	18,180	No	0.75
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	14,400	**15,470**	**YES**	1.07

Note: V/C Ratio = Volume-to-Capacity Ratio.

Note 1: During peak periods, a 3-lane cross section is assumed on Northstar Drive between SR 267 and the roundabout.

Source: LSC Transportation Consultants, Inc. *NorthstarMMP Sept2013.xlsx*

TABLE 11: Northstar Mountain Master Plan - 2032 Roadway Level of Service with Project-Level Development

Roadway Study Segment		Jurisdiction	LOS Standard	Unit	Threshold Volume	Design Volume	Deficient?	V/C Ratio
Summer								
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	11,400	**26,225**	**YES**	2.30
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	15,500	**27,570**	**YES**	1.78
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	15,500	**31,730**	**YES**	2.05
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,569	No	0.83
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,332	No	0.70
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	24,300	7,515	No	0.31
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	14,400	7,485	No	0.52
Winter								
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	11,400	**17,556**	**YES**	1.54
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	15,500	**23,458**	**YES**	1.51
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	15,500	**27,678**	**YES**	1.79
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,673	No	0.88
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,414	No	0.75
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	24,300	18,284	No	0.75
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	14,400	**15,574**	**YES**	1.08

Note: V/C Ratio = Volume-to-Capacity Ratio.

Note 1: During peak periods, a 3-lane cross section is assumed on Northstar Drive between SR 267 and the roundabout.

Source: LSC Transportation Consultants, Inc. *NorthstarMMP Sept2013.xlsx*

TABLE 12: Northstar Mountain Master Plan - 2032 Roadway Level of Service with Program-Level Development

Roadway Study Segment		Jurisdiction	LOS Standard	Unit	Threshold Volume	Design Volume	Deficient?	V/C Ratio
Summer								
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	11,400	**26,253**	**YES**	2.30
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	15,500	**27,621**	**YES**	1.78
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	15,500	**31,781**	**YES**	2.05
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,583	No	0.84
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,346	No	0.71
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	24,300	7,594	No	0.31
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	14,400	7,564	No	0.53
Winter								
SR 267	Between Brockway Summit and Northstar Drive	Placer County/ Caltrans	D	ADT	11,400	**17,587**	**YES**	1.54
SR 267	Between Northstar Drive and Airport Road/Schaffer Mill Road	Placer County/ Caltrans	D	ADT	15,500	**23,515**	**YES**	1.52
SR 267	Between Airport Road/Schaffer Mill Road and Nevada County Line	Placer County/ Caltrans	D	ADT	15,500	**27,735**	**YES**	1.79
SR 267	Between Nevada County Line and Brockway Road/Soaring Way	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,690	No	0.89
SR 267	Between Brockway Road/Soaring Way and I-80	Town of Truckee	D	Peak Hour, Peak Direction/Lane	1,891	1,431	No	0.76
Northstar Drive	Between SR 267 and Ridgeline Drive/Castle Peak Parking Lot [1]	Placer County	D	ADT	24,300	18,372	No	0.76
Northstar Drive	Between Ridgeline Drive/Castle Peak Parking Lot and Big Springs Drive	Placer County	C	ADT	14,400	**15,662**	**YES**	1.09

Note: V/C Ratio = Volume-to-Capacity Ratio.

Note 1: During peak periods, a 3-lane cross section is assumed on Northstar Drive between SR 267 and the roundabout.

Source: LSC Transportation Consultants, Inc. *NorthstarMMP Sept2013.xlsx*

Section 6
TRAFFIC IMPACTS AND MITIGATION

The following potential areas of transportation impacts are considered in this section:

- Intersection LOS
- Intersection Queuing
- Roadway LOS
- Traffic Safety at Project Driveways including Driver Sight Distance
- Additional Traffic Safety Hazards Created by Design Features
- VMT in Tahoe Basin
- Transit Systems and Facilities
- Bicycle and Pedestrian Safety and Facilities
- Construction Traffic Impacts
- Parking
- Consistency with the 2003 Martis Valley Community Plan

INTERSECTION LOS

As indicated in the previous Section, all study intersections are expected to operate within the applicable LOS thresholds under existing and future conditions, with or without the Northstar Mountain Master Plan Project (at any development level), so long as traffic control continues to be provided at the roundabout and at the Northstar Drive/Big Springs Drive intersection during busy winter periods. As Northstar's Traffic Management Plan includes this provision, no additional measures are necessary from an intersection LOS perspective.

Project Impact at SR 28/SR 267 Intersection

The project's impact at the SR 28/SR 267 intersection located within the Lake Tahoe Basin is discussed qualitatively. The Tahoe Regional Planning Agency (TRPA) established the following standard for signalized intersections in the Basin: LOS D and LOS E may be acceptable during peak periods not to exceed 4 hours per day. The SR 28/SR 267 intersection was recently analyzed by LSC as a part of the PC-3 Joerger Ranch Specific Plan EIR Project. The intersection currently operates at an acceptable LOS during the winter and summer PM peak hours (LOS C and LOS D, respectively). Implementation of the Project-Level Development is expected to increase the PM peak-hour traffic volumes through this intersection by up to 11 cars in the winter and 1 car in the summer. This level of additional traffic would not cause an exceedance of the LOS standard in 2012.

In 2032, this intersection is forecast to operate at an acceptable level without the proposed project (LOS E for less than 4 hours on a winter day, and LOS D on a summer day). The Program-Level improvements could result in an increase of up to 20 cars through this intersection during the winter PM peak hour and 9 cars during the summer PM peak hour. The Placer County Capital Improvement Program includes improvements to this intersection. The project's payment of traffic impact fees would mitigate any potential impacts during the winter scenarios. Finally, implementation of the project (at any development level) would not cause the LOS threshold to be exceeded during the summer season.

Countywide Traffic Impact Fee Program

The Countywide Traffic Impact Fee Program requires new development within Placer County to pay traffic impact fees. The fees collected through this program, in addition to other funding sources, allow the County to construct transportation facilities needed as a result of new development. The adopted Fee Program measures traffic impact in units of Dwelling Unit Equivalents (DUEs). One DUE is equivalent to the net impact of one single-family dwelling unit on regional traffic impacts (in the PM peak hour), considering the trip generation of the land use, the average trip length, and the proportion of trips that are new to the roadway system (not pass-by trips). The current traffic impact fee is $4,587 per Dwelling Unit Equivalent (DUE).

A detailed analysis of the DUEs associated with the Northstar Mountain Master Plan project is presented in the transit impacts discussion below. The results indicate approximately 42.87 DUE at the Project Level and a total of 77.47 DUE at the Program Level. Multiplying the respective DUEs by $4,587 yields traffic impact fee totals of $196,644.69 at the Project Level and $355,354.89 at the Program Level. (Note that the Program Level fee is comprised of the $196,644.69 associated with the Project Level plus an additional $158,710.20 for a total of $355,354.89.) Fees are collected prior to issuance of building permits.

In addition, although the SR 267/Northstar Drive intersection is forecast to operate at an acceptable LOS under all study scenarios, future (ultimate) improvements at this intersection are subject to the payment of a fair-share contribution. The project's fair-share percent contribution is calculated to be approximately 4.8 percent based upon the portion of the total future growth in the winter peak-hour total intersection traffic volume that is represented by the Project-Level traffic, or 8.9 percent for the Program-Level development (including Project-Level improvements). Finally, if the Placer County Board of Supervisors adopts an update to the current traffic mitigation fee ordinance, and the updated program includes this intersection location, that action and program will supersede the fair-share contribution requirements.

INTERSECTION QUEUING

A traffic queue length analysis was conducted for pertinent intersections to identify the potential for operational problems, as presented in the previous Section. Queue lengths are not forecasted to exceed the existing storage capacity at any of the study intersections during any of the analysis periods. Therefore, no mitigation measures are required.

ROADWAY LOS

The following study roadway segments currently exceed Caltrans' concept LOS (LOS D):

- SR 267 between Brockway Summit and Northstar Drive - **summer and winter**
- SR 267 between Northstar Drive and Airport Road - **winter only**
- SR 267 between Airport Road and Placer/Nevada County Line - **summer and winter**

Although the proposed project would increase traffic volumes, it would not cause any additional roadway segments to exceed any of the LOS thresholds in 2012. Furthermore, the project would result in a less than significant impact based on the County's Methodology of Assessment, as it would not exceed the County's minimum LOS policies at any study roadway location in 2012.

Under 2032 conditions, the same study roadway segments are expected to exceed Caltrans' concept LOS (LOS D), with or without the Master Plan project. The only difference is that the segment of SR 267 between Northstar Drive and Airport Road would exceed LOS D during the summer and winter seasons, due to the growth in background traffic from 2012 to 2032.

Additionally, the following Placer County study segment would exceed the County's LOS thresholds, with or without the project:

- Northstar Drive between roundabout and Big Springs Drive – **winter only**

Implementation of the project (Project Level or Program Level is not expected to cause any additional roadway segments to exceed the LOS thresholds. Furthermore, the project (at any development level) would result in a less than significant impact based on the County's Methodology of Assessment, as it would not exceed the County's minimum LOS policies at any study roadway location in 2032.

Roadway LOS Mitigation Measures

Widening of SR 267 to four lanes from Brockway Road/Soaring Way to south of Northstar Drive is included in the Placer County and Town of Truckee traffic impact fee programs. However, widening of SR 267 between Brockway Summit and Northstar Drive is not included in the Countywide CIP. However, based upon the County's Methodology of Assessment, the project impact to SR 267 is considered less than significant. Therefore, no mitigation measures are required at this location.

Widening of Northstar Drive to four lanes from SR 267 to Sawmill Flat Road (now referred to as Ridgeline Drive) has been completed. The County is no longer collecting funds toward this improvement. In addition, the County has determined that it is not appropriate to widen Northstar Drive west of Basque Road. However, consistent with *The Northside EIR,* widening between the Castle Peak Access/Ridgeline Drive roundabout and Basque Road has been identified as a necessary improvement.

Widening of Northstar Drive to the west of the roundabout is not included in the County's current Capital Improvement Program; any development project that would impact this roadway segment is required to pay its fair-share contribution toward future improvements on this segment of Northstar Drive. The project's fair-share percent contribution is calculated to be approximately 4.4 percent based upon the portion of the total future growth in the winter daily total two-way traffic volume that is represented by the Project-Level traffic, or 7.8 percent for the Program-Level development. It should be noted that detailed analysis of the traffic reductions occurring with a transport gondola (not within the scope of this study) could potentially reduce or eliminate this mitigation measure. Finally, if the Placer County Board of Supervisors adopts an update to the current traffic mitigation fee ordinance, and the updated program includes this location, that action and program will supersede the fair-share contribution requirements.

TRAFFIC SAFETY AT PROJECT DRIVEWAYS INCLUDING DRIVER SIGHT DISTANCE

At the Project Level, no new roadways or site access points are proposed. At the Program Level, a paved roadway would provide access to the relocated cross-country ski center parking area. The roadway improvements shall be designed to meet Placer County standards. No driver sight distance deficiencies or other traffic safety-related concerns are identified.

ADDITIONAL TRAFFIC SAFETY HAZARDS CREATED BY DESIGN FEATURES

There is no specific design features that would typically result in undue accident patterns, so long as existing applicable County roadway standards are applied to new roadways. Therefore, no traffic safety concerns pertaining to the project's design features are identified.

IMPACTS ON VMT IN THE TAHOE BASIN

The effect of the project on winter and summer daily Vehicle Miles Traveled (VMT) in the Tahoe Basin is dependent on the number of trips made to/from the Basin and the length of these vehicle trips. Table 13 presents the VMT analysis. The increase in daily trips made to/from the Basin (points beyond Brockway Summit) as a result of Project-Level improvements is approximately 36 one-way trips over the course of a busy winter day and 5 trips on a busy summer day. At the Program Level, approximately 67 or 33 one-way daily trips are expected to be generated in the Basin on a winter or summer day, respectively. The VMT generated by these trips is estimated by multiplying the daily trips by the average trip length. The estimated origins/destinations within the Basin for trips made by the additional Northstar employees is shown in Table 13. The highest portion of employee trips (about 40 percent) are expected to be made to/from the Kings Beach/Crystal Bay area. Applying the trip distribution pattern to the total daily trips yields the number of trips made to each area within the Basin. The average trip length between Brockway Summit and each origin/destination point in the Basin is shown in the lower middle column of the table. The average trip length for trips made to/from the Program-Level campgrounds is estimated to be about 13 miles within the Basin. The weighted average trip length for all project trips on Basin roadways is calculated to be approximately 8.1 miles. Multiplying the trip lengths by the number of trips yields the daily VMT shown in the lower right portion of the table.

As indicated, the Project-Level development is estimated to increase daily VMT by approximately 296 over the course of a winter day, and 43 over the course of a summer day. At the Program Level, the resulting increase would be 598 winter VMT and 376 summer VMT. In comparison with the TRPA's 2011 estimate of 2,036,642 existing VMT on a summer day in the Tahoe Basin, the increase in region-wide VMT resulting from the Project-Level development is negligible. The Program-Level development is estimated to increase region-wide VMT by about 0.02 percent on a summer day. According to the *TRPA 2011 Threshold Evaluation*, basin-wide VMT is currently better than the TRPA's adopted threshold standard of 2,067,568 VMT, resulting in an "at or somewhat better than target" status determination. Implementation of the project (at any development level) would not cause the VMT threshold to be exceeded. Note the TRPA's VMT estimate pertains to an "annual peak day," which typically occurs during August.

IMPACTS ON TRANSIT SERVICES

The increase in employment associated with the proposed project will increase demand for public transit services. As discussed above, approximately 10 percent of existing Northstar employees commute currently using the Tahoe Area Regional Transit (TART) services, while an additional 15 percent use private bus shuttle service provided by Northstar. Applying these factors to the forecast number of employees, and considering that 45 percent of employees are expected to commute in the peak direction in the peak-hour, the increase in winter peak-hour peak-direction ridership on TART services is estimated to be 5 passengers if the private shuttle service continues or 12 if the private shuttle service is not available. At present, the TART 267 Route service is at capacity at peak times in the peak directions at Northstar on peak winter

TABLE 13: Northstar Mountain Master Plan - Daily VMT Generated in Lake Tahoe Basin

Origin/Destination Within Lake Tahoe Basin		Employee Trip Distribution	Number of One-Way Daily Trips Entering and Exiting Tahoe Basin			
			Project Level		Program Level	
			Winter	Summer	Winter	Summer
Employees						
Kings Beach / Crystal Bay		40%	14.6	2.1	22.5	4.2
Incline Village		18%	6.6	0.9	10.1	1.9
South Shore		2%	0.7	0.1	1.1	0.2
Tahoe City		22%	8.0	1.2	12.4	2.3
Tahoe Vista		12%	4.4	0.6	6.8	1.3
West Shore		6%	2.2	0.3	3.4	0.6
Program Level Campgrounds		*N/A*	*N/A*	*N/A*	*10.9*	*22.4*
Total Trips		*100%*	*36*	*5*	*67*	*33*
VMT in Tahoe Basin to:	Reference Point [1]	Distance (Miles)	Daily Vehicle-Miles Traveled in Lake Tahoe Basin			
Employees						
Kings Beach / Crystal Bay	SR 28 / Chipmunk Avenue	4.1	60	9	92	17
Incline Village	SR 28 / Country Club Drive	9.8	64	9	99	19
South Shore	US 50 / Ski Run Blvd	34.6	25	4	39	7
Tahoe City	Lake Forest Road (east)	10.1	81	12	125	23
Tahoe Vista	SR 28 / Granite Road	5.4	24	3	37	7
West Shore	Tahoe Ski Bowl Way	19.2	42	6	65	12
Program Level Campgrounds	*N/A* [2]	*13.0*	*N/A*	*N/A*	*141*	*291*
Total VMT			**296**	**43**	**598**	**376**

Note 1: Distances are measured from Brockway Summit on SR 267 to the points listed in this column.
Note 2: Persons generating a trip from the proposed campgrounds into the Tahoe Basin are estimated to have an average travel distance of 13 miles within the Lake Tahoe Basin.

Source: LSC Transportation Consultants, Inc. *NorthstarMMP Sept2013.xlsx*

days. (Garner, 2013) (As the employee transit demand in summer would be lower and as adequate capacity exists, there is no potential for this project to generate demand exceeding capacity in summer.)

While the additional transit demand associated with the additional employees generated by the Master Plan improvements may not warrant additional public transit services (and costs), it would add to the cumulative need for additional winter peak-hour transit capacity serving Northstar. Consistent with requirements placed on other development proposals in Northstar over the last several years, it is appropriate for the project applicant to participate in the capital and on-going operational requirements of additional transit service. Placer County has established County Service Area 28 (Zone of Benefit 204) to provide this funding mechanism for all development within Martis Valley (including Northstar). By paying into this County Service Area, the project applicant would be addressing this impact.

Transit County Service Area Fee Calculation

Placer County's Board of Supervisors adopted the *"Martis Valley Community Plan"* on December 16, 2003. As a mitigation measure, a transit funding mechanism was implemented for the Martis Valley area. Specifically, County Service Area (CSA) zones of benefit are applied to development projects in the Martis Valley Community Plan area, to fund the following:

A. Transit Services
   1) Year-round public transit service along SR 267 and Schaffer Mill Road, connecting Martis Valley with Truckee to the north and Kings Beach/Crystal Bay to the south.

B. Transit Buses
   1) Partial funding of transit vehicles, including replacement after 10 years.

The rate of assessment for each parcel is calculated based upon the traffic generated on regional roadways by each parcel. The methodology used to estimate traffic impact is consistent with that used in the adopted Placer County Traffic Fee Program (Reference: Placer County Code – Chapter 15.28), which measures traffic impact in units of Dwelling Unit Equivalents (DUEs). One DUE is equivalent to the net impact of one single-family dwelling unit on regional traffic impacts (in the PM peak hour), considering the trip generation of the land use, the average trip length, and the proportion of trips that are new to the roadway system (not pass-by trips).

While the Traffic Fee Program cites DUE equivalents for a wide variety of land use types, this does not include a value for ski resorts, for resort employees, or for campgrounds. As shown in Table 14, the methodology used to calculate DUE and associated fees is as follows:

- For each land use quantity generating vehicle-trips, the total number of PM peak-hour trips shown in the trip generation table (Table 2) was carried over. Note that this figure already reflects reductions for non-auto travel.

- An average trip length per employee trip of 7.1 miles was drawn from the calculation used to identify traffic impact fees for the Northstar Forest Flyer project. For public services trips and trips associated with the campgrounds in the Program Level, the average of the distance from Northstar to Truckee and to Kings Beach (6.2 miles) was applied.

- All trips are conservatively assumed to be new trips on the roadway network (rather than pass-by trips already on the roadway network).

- Multiplying the peak-hour trip generation by the average vehicle length yields the VMT by trip generation category.

- Dividing by the VMT per DUE (5.05, per the Countywide Traffic Fee Program Schedule) yields the DUE by trip generation category. Summing over the various trip generation categories yields the total DUE by season and by development level.

As indicated, the Project-Level proposal generates a DUE of approximately 42.87 in winter and 4.04 in summer. As the higher value pertains, the DUE associated with the Project-Level proposal is 42.87. Similarly, a total of approximately 77.47 DUE are associated with the Program-Level improvements. Multiplying by the current fee per DUE applied to the Northstar Northside project ($39.79) by the total DUE yields the total annual fee. The fee calculations are as follows:

- 42.87 DUE x $39.79/DUE = $1,705.80 at Project Level
- 77.47 DUE x $39.79/DUE = $3,082.53 at Program Level

Note that the Program-Level fee includes the Project-Level fee.

As with other Zones of Benefit under the CSA program, assessments will be made on individual parcels. It will therefore be necessary to allocate the various development quantities to individual parcels. The allocation of DUE to each specific project parcel is provided in Table 15. Finally, the amount of assessment specified for each year is adjusted based upon the Consumer Price Index (up to a maximum of 5 percent per year).

BICYCLE AND PEDESTRIAN SAFETY AND FACILITIES

There are currently no designated bicycle or pedestrian facilities along SR 267 or Northstar Drive. However, the Placer County Regional Bikeway Plan proposes a Class II bike lane from Truckee to Kings Beach along SR 267. In addition, the Martis Valley Trail is a planned Class I bike path on the west side of SR 267 from Truckee to Northstar (which is not included in the Regional Bikeway Plan). This trail would be about 5.4 miles long, and it would connect to Northstar Drive either near the highway or up toward the Northstar Village, depending on which alignment is chosen.

The *Martis Valley Community Plan* states that Class II bike lanes should be provided along Northstar Drive. The need for this improvement may be impacted by the provision of a Martis Valley Trail connecting Northstar Village with Truckee, one option of which would parallel Northstar Drive. As it would increase commuting, the proposed Master Plan project would slightly increase bicycling activity along the Northstar Drive corridor. The growth in traffic would also increase the need for Class II lanes. Given that the increase in traffic during the summer (when bicycling is more prevalent) is only 0.6 percent at the Project Level and 3.8 percent at the Program Level, however, no significant impact would occur on bicycling and pedestrian conditions.

TABLE 14: Northstar Mountain Master Plan - Dwelling Unit Equivalents (DUE)

Proposed Land Uses	Quantity	Unit	Total PM Peak Hour Trips [1]	Trip Length (Miles)	% New Trips	VMT	VMT per DUE	DUE
PROPOSED PROJECT-LEVEL DEVELOPMENT								
Winter								
Additional Employees	72	Employees	27	7.1	100%	191.7	5.05	37.96
Additional Public Services	3	Vehicles	4	6.2	100%	24.8	5.05	4.91
Total Winter Project Level			***31***					**42.87**
Summer								
Additional Employees	4	Employees	2	7.1	100%	14.2	5.05	2.81
Additional Public Services	1	Vehicle	1	6.2	100%	6.2	5.05	1.23
Total Summer Project Level			***3***					**4.04**
PROGRAM LEVEL DEVELOPMENT								
Winter								
Remote Campground at Mountain Top	50	Guests	10	6.2	100%	62.0	5.05	12.28
Additional Employees	112	Employees	42	7.1	100%	298.2	5.05	59.05
Additional Public Services	4	Vehicles	5	6.2	100%	31.0	5.05	6.14
Total Winter Program Level			***57***					**77.47**
Summer								
Campground at Relocated Cross-Country Center	50	Guests	8	6.2	100%	49.6	5.05	9.82
Remote Campground at Mountain Top	50	Guests	10	6.2	100%	62.0	5.05	12.28
Additional Employees	8	Employees	4	7.1	100%	28.4	5.05	5.62
Additional Public Services	2	Vehicles	3	6.2	100%	18.6	5.05	3.68
Total Summer Program Level			***25***					**31.40**

Note 1: Reference Trip Generation Table 2.

Source: LSC Transportation Consultants, Inc. and Countywide Traffic Impact Fee Program Schedule *NorthstarMMP Sept2013.xlsx*

CONSTRUCTION TRAFFIC IMPACTS

The project is proposed to be constructed in phases, with each phase occurring during the summer season. Construction staging would occur in the day parking area to the west of Northstar Village and in the Castle Peak parking area, as well as more project specific areas on the mountain. It is anticipated that the project will require approximately 22 construction workers over the course of a typical busy construction day. Dividing 22 workers by an estimated average vehicle occupancy rate of 1.2 employees per vehicle (based on data from the *U.S. Census 2005-2009 American Community Survey* for the Truckee area) equates to a total of approximately 19 construction worker vehicles on-site per day. Assuming one-third of the workers make a round-trip off-site for lunch, errands, etc., a total of about 50 daily one-way vehicle trips made external to Northstar are expected to be generated by construction employees. About 70 percent of the employees are assumed to leave the site during the PM peak hour. Multiplying 70 percent by the 19 worker vehicles yields approximately 13 exiting trips during the summer PM peak hour. About 80 percent of the workers are assumed to commute from points north on SR 267, such as Truckee or Reno. The remaining 20 percent of workers are assumed to commute from points south on SR 267, such as the North Tahoe area. The resulting trip generation during the PM peak hour would be approximately 10 vehicles on the exiting left-turn movement from Northstar Drive and 3 vehicles on the exiting right-turn movement. Adding this traffic and any miscellaneous material or equipment delivery trips to the existing summer PM peak-hour traffic is not expected to cause any additional study intersections or roadways to exceed the applicable LOS thresholds. The project is not assumed to generate a substantial amount of import or export material. As such, no significant truck hauling trips are expected to be associated with the excavation and tree removal phases

PARKING IMPACTS

Day skier parking is currently provided in the Village Pay Lot, the Village View Lots and the Castle Peak Parking Area. On peak days when the Castle Peak Lots have reached capacity, vehicles are parked at the Golf Course Lot, which is served by transit. When these lots begin to reach capacity on peak season days and resort daily pass sales reach a level indicating that onsite parking will be exceeded, Northstar notifies guests through the following means that parking is unavailable:

- Information is provided via low-wattage AM radio.
- Information is provided via Northstar's website.
- Changeable Message Signs are installed within the Caltrans or the Town of Truckee Right-of-Way notifying customers that Northstar parking is full and to avoid SR 267.

The capacity of the mountain is primary limited by the parking supply, rather than the capacity of the ski lifts or terrain. The parking impacts of the Project-Level and Program-Level improvements were evaluated under winter and summer conditions.

TABLE 15: Northstar Mountain Master Plan - CSA Parcel Allocation

Parcel	APN	Owner	Total New Winter Employees [1]	DUE per Parcel		Annual Fee per Parcel [2]	
				Project-Level Development	Program-Level Development	Project-Level Development	Program-Level Development
C Lift Bottom Terminal	110-050-054	Trimont Land Company	10	7.26	6.73	$288.88	$267.79
J Lift Bottom Terminal	110-081-041	NMP	12	8.72	8.06	$346.97	$320.71
V Lift Bottom Terminal	080-260-013	Trimont Land Company	9	6.54	6.05	$260.23	$240.73
W Lift Bottom Terminal	080-260-010	Trimont Land Company	7	5.09	4.70	$202.53	$187.01
Z Lift Bottom Terminal	080-260-002	Trimont Land Company	4	2.91	2.69	$115.79	$107.04
Summit Deck and Grille Expansion	110-070-015	Trimont Land Company	4	2.91	2.69	$115.79	$107.04
Backside Warming Hut	080-260-013	Trimont Land Company	5	3.63	3.36	$144.44	$133.69
Front Side Runs and Snowmaking	110-050-073	Trimont Land Company	5	3.63	3.36	$144.44	$133.69
Backside Runs and Snowmaking	080-260-013	Trimont Land Company	3	2.18	2.02	$86.74	$80.38
Q Lift Bottom Terminal	080-260-017	Trimont Land Company	7	--	4.70	--	$187.01
Castle Peak Transport Gondola in Parking Lot	110-030-069	Trimont Land Company	12	--	8.06	--	$320.71
Skier Service Site - Top of J Lift	110-050-040	Trimont Land Company	7.5	--	5.04	--	$200.54
Skier Service Site - Top of C Lift	110-050-073	Trimont Land Company	7.5	--	5.04	--	$200.54
Cross Country Center and Campground	110-050-054	Trimont Land Company	4	--	2.69	--	$107.04
Backside Campground [3]	080-260-002	Trimont Land Company	0	--	12.28	--	$488.62
Total Winter DUE/Fee			***107***	***42.87***	***77.47***	***$1,705.80***	***$3,082.53***

DUE = Dwelling Unit Equivalence

NOTE: As ten (10) additional employees (FTE) are included in the total that are not assigned to any specific parcel, their DUE's were allocated to all of the parcels proportionally.

Note 1: Full-equivalent (FTE) employees.

Note 2: Assumes an annual fee of $39.79 per DUE.

Note 3: DUE assigned to the "Backside Campground" are based on the number of campers. See Table 12.

Source: Parcel Allocation provided by Northstar Staff

NorthstarMMP Sept2013.xlsx

Project-Level Parking Impacts

The Project-Level improvements do not propose to expand parking facilities, as the proposed improvements are intended to enhance the experience for visitors, rather than increase the number of day skiers. The Project-Level mountain improvements and skier services would not generate the need for additional skier parking spaces, as the vehicle trip generation of skier services is considered to consist of employees and service vehicles only. Based upon the trip generation shown in Table 2, and assuming that 10 percent of employees work night/evening shifts and therefore do not generate demand during periods of peak demand, the Project-Level improvements are estimated to require approximately 44 parking spaces. According to Northstar staff, the Golf Course Lot (which is accessed from Basque Drive) is rarely used. As the additional employees would park in the same lots as the day skiers, there is the potential for the project to expand the days/durations when the Golf Course Lot (99 spaces) is utilized. None of the other Project-Level improvements are expected to increase the parking demand. During the summer, the majority of the day skier parking spaces in the Village Lots will be empty, thereby providing ample parking for the additional summer employees and services. Therefore, adequate parking conditions are expected to be provided with the project.

Program-Level Parking Impacts

At the Program Level, the additional employees, service vehicles, and the vehicles associated with the remote campground would park in the same lots as the day skiers. However, a new 20-space parking lot would be provided at the relocated cross-country ski center. Some or all cross-country skiers currently parking in the Village Lots and Castle Peak Lots can be expected to relocate to this new lot, thereby opening up some parking spaces in the day skier lots. Based upon the trip generation shown in Table 2, and assuming that 10 percent of employees work night/evening shifts and therefore do not generate demand during periods of peak demand, the Program-Level uses are estimated to require approximately 69 employee parking spaces plus about 15 spaces associated with the mountaintop campground, for a total of about 84 spaces.

The number of parking spaces in the day skier parking lots that are utilized by the additional employees, service vehicles, and vehicles associated with the remote campground would to some extent be offset by the spaces made available due to the relocation of the cross-country skier vehicles. In addition, according to Northstar staff, the Golf Course Lot (99 spaces) is rarely used. As the additional employees would park in the same lots as the day skiers, there is the potential for the project to expand the days/durations when the Golf Course Lot is utilized. There is also the potential for the Program-Level project to expand the days/durations when the Northstar parking lots reach capacity, although no parking deficiencies are expected.

During the summer, the majority of the day skier parking spaces in the Village Lots will be empty, thereby providing ample parking for the additional summer employees and services, and the remote group campground. Vehicles associated with the new group campground at the new cross-country ski center parking lot would be accommodated in the new lot. Overall, adequate parking conditions are expected to be provided at the program level.

CONSISTENCY WITH MARTIS VALLEY COMMUNITY PLAN

The proposed project's consistency with the adopted *Martis Valley Community Plan* (MVCP) (Placer County, 2003) was reviewed. In general, the proposed NMMP appears to be consistent with the transportation goals and policies set forth in the adopted MVCP. With participation in

the CSA funding transit service improvements, as well as its fair-share contribution to widening along Northstar Drive and future improvements at the SR 267/Northstar Drive intersection, the project would be consistent with the transportation-related elements of the Martis Valley Community Plan.

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APPENDIX A

Northstar Traffic Counts

Intersection: Northstar Dr / SR267
Location: Truckee / Northstar
North/South Street: SR267
East/West Street: Northstar Dr

Date: 8/26/2011 Friday
Time: 3:00PM-6:00 PM
Name: Jason
Project #: 117200

Time Period			NB - SR 267			SB - SR 267			EB - Northstar Dr			WB		
Beginning	Ending		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
3:00PM	3:15PM		10	108	0	0	101	40	35	0	20	0	0	0
3:15PM	3:30PM		21	73	0	0	108	38	26	0	29	0	0	0
3:30PM	3:45PM		13	79	0	0	142	46	34	0	20	0	0	0
3:45PM	4:00PM		8	75	0	0	87	26	35	0	14	0	0	0
4:00PM	4:15PM		15	86	0	0	130	26	29	0	29	0	0	0
4:15PM	4:30PM		14	91	0	0	127	27	46	0	22	0	0	0
4:30PM	4:45PM		22	81	0	0	133	20	35	0	19	0	0	0
4:45PM	5:00PM		11	81	0	0	113	27	27	0	25	0	0	0
5:00PM	5:15PM		18	81	0	0	134	33	37	0	21	0	0	0
5:15PM	5:30PM		11	82	0	0	134	29	26	0	21	0	0	0
5:30PM	5:45PM		14	99	0	0	94	19	42	0	22	0	0	0
5:45PM	6:00PM		7	57	0	0	107	30	39	0	37	0	0	0
PM Peak Hour Volume			**65**	**334**	**0**	**0**	**507**	**107**	**145**	**0**	**87**	**0**	**0**	**0**
PM Peak Hour Factor			0.74	0.92			0.95	0.81	0.79		0.87			

Intersection: SR267 / Northstar Dr
Location: Truckee
North/South Street: SR 267
East/West Street: Northstar Dr

Date: 1/15/2011 Saturday
Time: 2:45PM-4:45 PM
Name: Dave O
Project #: 117010

Time Period			NB - SR 267			SB - SR 267			EB -Northstar Dr			WB		
Beginning	Ending		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2:45PM	3:00PM		20	57	0	0	94	52	100	0	80	0	0	0
3:00PM	3:15PM		16	63	0	0	94	75	101	0	68	0	0	0
3:15PM	3:30PM		14	61	0	0	93	64	161	0	97	0	0	0
3:30PM	3:45PM		31	56	0	0	87	38	187	0	103	0	0	0
3:45PM	4:00PM		17	92	0	0	83	45	219	0	107	0	0	0
4:00PM	4:15PM		34	65	0	0	120	54	254	0	95	0	0	0
4:15PM	4:30PM		27	73	0	0	85	57	207	0	170	0	0	0
4:30PM	4:45PM		17	93	0	0	122	45	230	0	175	0	0	0
PM Peak Hour Volume			**95**	**323**			**410**	**201**	**910**		**547**			
PM Peak Hour Factor			0.70	0.87			0.84	0.88	0.90		0.78			

Intersection: Northstar Dr / Castle View Parking Roundabout
Location: Truckee / Northstar
North/South Street: Castle View Parking Roundabout
East/West Street: Northstar Dr

Date: 8/12/2011 Friday
Time: 2:00PM-5:00 PM
Name: Karl
Project #: 117200

Time Period			NB - Rock Ridge			SB - Castle View Lot			EB - Northstar Dr			WB - Northstar Dr		
Beginning	Ending		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2:00PM	2:15PM		2	1	2	1	1	0	0	26	3	1	27	0
2:15PM	2:30PM		4	0	8	0	0	0	0	30	1	0	41	2
2:30PM	2:45PM		2	0	2	0	1	0	1	54	9	1	45	0
2:45PM	3:00PM		1	1	4	0	1	2	4	43	7	1	42	1
3:00PM	3:15PM		8	0	2	0	0	1	0	23	5	1	40	1
3:15PM	3:30PM		2	0	4	1	0	0	1	31	4	2	29	1
3:30PM	3:45PM		11	1	7	1	0	0	0	43	5	6	38	0
3:45PM	4:00PM		0	0	7	0	0	0	1	51	12	4	61	1
4:00PM	4:15PM		2	0	8	2	0	1	2	56	6	0	34	0
4:15PM	4:30PM		5	1	12	2	0	2	0	57	3	0	40	3
4:30PM	4:45PM		2	0	3	0	0	0	1	55	6	2	54	0
4:45PM	5:00PM		3	0	8	3	1	0	0	51	4	1	39	3
PM Peak Hour Volume			**9**	**1**	**30**	**4**	**0**	**3**	**4**	**219**	**27**	**6**	**189**	**4**
PM Peak Hour Factor			0.45	0.25	0.63	0.50	#DIV/0!	0.38	0.50	0.96	0.56	0.38	0.77	0.33

Intersection: Castel Peak Lots / Northstar Dr
Location: Truckee
North/South Street: Parking Lot
East/West Street: Northstar Dr

Date: 12/22/2012 Saturday
Time: 7:30AM-10:30AM 3:00PM-6:00PM
Name: Robyn
Project #: _____

Time Period			NB -Rocky Ridge Rd			SB - Castle View Parking Lots			EB - Northstar Dr			WB - Northstar Dr		
Beginning	Ending		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
3:00PM	3:15PM		10	4	14	22	2	2	3	65	9	3	32	3
3:15PM	3:30PM		4	1	18	13	1	10	8	64	9	0	24	4
3:30PM	3:45PM		2	0	14	25	7	9	8	92	6	4	32	6
3:45PM	4:00PM		8	3	20	31	7	13	7	77	16	6	47	2
4:00PM	4:15PM		5	1	14	31	4	7	7	87	9	2	48	2
4:15PM	4:30PM		2	3	17	30	4	13	6	102	20	2	37	0
4:30PM	4:45PM		5	5	11	38	4	6	8	120	7	1	22	0
4:45PM	5:00PM		4	3	31	58	5	5	3	108	5	1	18	0
5:00PM	5:15PM		5	2	18	41	1	6	9	83	4	8	18	2
5:15PM	5:30PM		2	2	18	20	1	5	9	109	13	6	40	5
5:30PM	5:45PM		7	4	14	36	3	7	4	69	6	4	49	1
5:45PM	6:00PM		8	6	16	12	1	2	7	80	12	4	28	0
PM Peak Hour Volume			**16**	**12**	**73**	**157**	**17**	**31**	**24**	**417**	**41**	**6**	**125**	**2**
PM Peak Hour Factor			0.80	0.60	0.59	0.68	0.85	0.60	0.75	0.87	0.51	0.75	0.65	0.25

Traffic Turning Movement Counts

Start Date	7/9/2010							
Start Time	1:00 PM							
Street Name	Northstar Drive				Big Springs Drive			
Direction	Northbound		Southbound		Eastbound			
	Left	Thru	Thru	Right	Left	Right	Total	1hr total
1:00 PM	2	21	25	12	18	4	83	402
1:15 PM	4	33	35	14	10	0	102	420
1:30 PM	8	35	36	16	9	2	107	**429**
1:45 PM	21	33	30	9	8	6	110	406
2:00 PM	2	28	36	14	13	4	101	396
2:15 PM	4	31	36	14	16	4	111	406
2:30 PM	5	24	26	13	12	4	84	386
2:45 PM	3	32	43	5	12	5	100	406
3:00 PM	3	40	33	18	11	6	111	413
3:15 PM	4	34	28	7	12	6	91	392
3:30 PM	5	37	25	23	13	1	104	398
3:45 PM	4	44	38	10	9	1	107	397
4:00 PM	5	27	34	12	9	3	90	426
4:15 PM	7	26	36	13	11	4	97	
4:30 PM	4	26	35	26	10	2	103	
4:45 PM	14	40	42	19	13	6	136	
Peak-Hour Volume	**35**	**127**	**138**	**53**	**46**	**16**	**429**	
4-hour total	95	511	538	225	186	58	1637	

Traffic Turning Movement Counts

Start Date	3/27/2010							
Start Time	2:00 PM							
Street Name	Northstar Drive				Big Springs Drive			
Direction	Northbound		Southbound		Eastbound			
	Left	Thru	Thru	Right	Left	Right	Total	1hr total
2:00 PM	11	31	32	5	14	3	96	511
2:15 PM	7	47	43	12	15	4	128	581
2:30 PM	8	44	43	9	22	8	134	633
2:45 PM	10	54	50	9	23	6	153	680
3:00 PM	11	59	46	8	35	7	166	727
3:15 PM	11	84	46	6	29	4	180	792
3:30 PM	13	78	39	4	40	7	181	854
3:45 PM	11	89	43	11	41	5	200	932
4:00 PM	12	94	49	11	48	15	231	**989**
4:15 PM	13	92	50	7	63	16	242	982
4:30 PM	13	101	57	10	64	14	259	957
4:45 PM	7	87	56	14	67	26	257	861
5:00 PM	15	80	48	15	58	8	224	723
5:15 PM	15	77	30	12	73	10	217	
5:30 PM	9	77	35	15	17	10	163	
5:45 PM	17	41	18	8	20	14	119	
Peak-Hour Volume	**45**	**374**	**212**	**42**	**242**	**71**	**989**	

APPENDIX B

Northstar Traffic and Parking Management Plan

Traffic and Parking Management Plan
Northstar California Resort
July 2013

PLAN GOALS

The following plan is implemented by Northstar California Resort (Northstar) during winter operations to achieve the following goals:

- Ensure that public safety and emergency access conditions are optimal.
- Minimize the impact of ski area traffic and parking activity on residents of the Northstar area and the Tahoe-Truckee region.
- Provide adequate parking for guests and employees.
- Provide a straightforward and convenient ingress and egress experience to resort guests and begin a positive guest experience.
- Respond to changes in access and parking associated with approved development in the area.
- Provide flexibility in traffic management and parking operations to respond to expected visit levels and minimize the impact of parking and roadway improvements on the Northstar environment.

The Northstar Access Management Team (AMT) periodically meets to coordinate operations and discuss changes in access patterns and parking/roadway facilities within Northstar and the Tahoe-Truckee region. The Traffic and Parking Management Plan is a working document that is updated yearly (e.q., signage updates, lot staffing, lot operations, shuttles, employee carpool incentives) to reflect current successful management strategies.

OVERVIEW

Northstar operates for +/-150 days during an average winter season. Specific operational strategies are employed as part of a comprehensive Traffic and Parking Management Plan throughout the season. The nature of ski area operations is that guest and employee levels vary significantly over the course of the season and that effective transportation management strategies can be adjusted depending on these levels. Management strategies are based on the following levels:

- Blue Level Days (low) – Generally 0 to 3,000 Total Expected Skier Visits

- Green Level Days (medium) – Generally 3,001 to 4,500 Total Expected Skier Visits

- Yellow Level Days (medium high) – Generally 4,501 to 7,000 Total Expected Skier Visits

- Red Level Days (high) – Generally 7,001+ Total Expected Skier Visits

    - Note that Red Level practices are implemented on days designated for Yellow Level if two or more of the following regional ski areas close prior to 11 AM: Squaw Valley USA, Alpine Meadows Ski Area, Sugar Bowl Ski Resort, or Heavenly Mountain Resort.

Generally speaking, Northstar operates at Blue/Green Level Days. It is recognized, however, that weather and external events can affect attendance levels in unpredictable ways.

This plan focuses on the following parking areas and access points (see Exhibit 1-Northstar Parking Areas):

- Auto Drop-Off Zone: Adjacent to the west end of the Village – This area is designated for guests to independently drop and pick up passengers in their own vehicles. Vehicles in this area must not be left unattended. The Auto Drop-Off Zone has two short term parking spaces available for guests checking into Tahoe Mountain Resorts Lodging.

- Transit Center: Northwest of the Village adjacent to Copper Lane – Northstar Dial-A-Ride shuttles, parking shuttles, and regional public transit shuttles utilize this area for passenger pickup, drop off, and transfers. The Transit Center features eight designated passenger load/unload zones, marked by posts numbered one through eight. Each designated stop has a specific destination.

- Village View Lots: Lot A through Lot K, with access provided from 1) Northstar Drive opposite the Transit Center access point; and 2) Big Springs Drive.

- Castle Peak Park and Ride Lots: Access provided by the northern leg of the Northstar Drive Roundabout.

- Village Lower Pay Lots: North of the Village.

- Other Parking Lots: Parking is also available at the CSA Building and the Northstar Golf Course. There is also parking associated with the Sawmill Heights employee housing, the Village at Northstar, and Highlands improvements that Northstar does not own or control.

The following discussion presents overall management strategies that are in place throughout the entire ski season, followed by those strategies that are part of the specific plan levels.

OVERALL MANAGEMENT STRATEGIES

Bus Fleet Composition

Northstar has an extensive fleet of approximately 40 buses that are used to successfully operate the transit services. These buses consist of the following categories:

- Parking shuttles: 18 transit buses with average capacity of 37 – 55 passengers.
- Small shuttles: 16 cutaways or similar with average capacity of 25 – 45 passengers.
- Other shuttles: 5 buses with average capacity of 42 passengers.

Northstar manages its bus fleet based on guidance provided by the California Air Resources Board (CARB) and its Emission Reduction Program Schedule of Compliance. The fleet is tested annually for exhaust smoke opacity levels as required by CARB. The buses in the fleet are retired, replaced or retrofitted with Diesel Particulate Filters (DPF) to meet the CARB schedule of compliance for Heavy Duty and Medium Duty vehicles.

Peak Day Parking Management

Northstar is a destination resort that provides a high-quality recreational experience for both the day skier and the "destination" oriented guest. Northstar strives to accommodate the approved bed-base and extend the vacation experience into the non-peak weekdays and reduce traffic on peak weekends and holidays. When peak days are experienced and onsite parking spaces reach capacity, Northstar notifies guests through the following means that parking is unavailable:

- Information is provided via the low-wattage AM radio, the website, and Changeable Message Signs (CMS) installed within the Caltrans or the Town of Truckee Right-Of-Way (ROW) notifying customers that Northstar parking is full and to avoid SR 267.

Measures Implemented to Assist Entering Traffic Routes

- Information is provided via the low-wattage AM radio, the website, and CMS to inform incoming drivers that drop-off activity can be accommodated at the Auto Drop-Off Zone and to direct traffic to the Village View Lots or the Castle Peak Park and Ride Lots. These messages focus on communicating the convenience of the transit shuttle service.
- On peak days, Northstar provides manual traffic control at the Northstar Drive/Big Springs Road intersection.

- Northstar coordinates with Caltrans on traffic light timing on the SR 267 corridor.

- Northstar provides an onsite Dial-a-Ride service for +/-2,000 homes and condominiums to reduce traffic on the Northstar roadway infrastructure and promote efficient ingress/egress for guests.

Auto Drop-Off Zone

- Modifications have been completed to improve traffic flow within the Auto Drop-Off Zone and along Northstar Drive from Big Springs Drive to the Auto Drop-Off Zone. This also aids in emergency access.

- A fire lane access point is designated along the curb using signs and painted curb.

- Traffic management training is provided for all Auto Drop-Off Zone staff.

- The Auto Drop-Off Zone is managed with orange cones or directional signage on posts to make one travel lane and two drop-off lanes. Parking control staff actively move cones/signs to aid drivers attempting to enter/exit the Auto Drop-Off Zone.

- All staff have a distinguishable uniform and high visibility safety vests when directing guests.

- "No Unattended Vehicles" signs are posted in the Auto Drop-Off Zone. Parking control staff actively monitors this area to keep drivers with their vehicles in case they need to be moved in order to provide emergency vehicle access.

Village View Lots

- The Village View Lots are parked first and then the Castle Peak Park and Ride Lots are parked if needed.

- Traffic is directed to enter from Lot K, off of Big Springs Drive and west of Martis Landing. Directional signage is placed on Big Springs Drive between Northstar Drive and the entrance to Lot K indicating "Guest Parking" with directional arrow.

- Parking shuttles are available from 8:00 AM until 10:00 PM daily during the ski season in the Village View Lots.

- Employee parking is in Village View Lots E – K during the winter season.

- Lots are staffed as needed to efficiently manage inbound and outbound parking activity.

- A CMS is installed on Northstar Drive (approx. 200 feet north of Big Springs Road) to direct arriving guests of the free parking in the Village View Lots or Village Lower Pay Lots north of the Village.

Castle Peak Park and Ride Lots

- Parking shuttles are available when this lot opens for guests and employees. Parking staff is provided to greet and direct guests in this lot. Staffing levels are adjusted based on business volumes.

- Parking shuttles operate from these lots to the Northstar Transit Center.

- Offsite tour buses that are organized through Northstar Group Sales are parked in Lot 18 on green, yellow, and red days and park in the Valet Lot (below the Transit Center) on all blue days (3,000 skier visits or less expected)

- A CMS is installed on Northstar Drive (approx. 200 feet east of the Northstar Drive Roundabout) to direct arriving guests to the Village View Lots and Castle Peak Park and Ride Lots.

Village Lower Pay Lots

- Staffing starts between 6:30 and 7:00 AM daily.

- A paid parking attendant is stationed at the entrance of the paid lot to collect money and direct guests to a parking space.

- Valet Parking is located between the Transit Center and Village Lower Pay Lots. Valet Parking is open on weekends and holidays beginning mid-December.

- Short term, two-hour parking is provided in the Village Two-Hour Lot on the left of Currant Drive. The Village Two-Hour Lot provides parking for guests coming to dine and shop in the Village and Ski School drop-off, with two-hour parking limits monitored by Northstar staff.

SKIER VISIT LEVEL MANAGEMENT STRATEGIES

Blue Level Days

- Employee parking is located in Village View Lots E – K during the winter season to keep the parking spaces closer to the Village open for guests.

- Only the Village View Lots and the Village Lower Pay Lots are parked. These lots are serviced with three parking shuttles, operating between 8:00 AM and 7:00 PM.

- The following transit services are in operation:

The Northstar neighborhoods are served by four buses running from 8:00 AM until 5:00 PM, along with two afternoon/evening bus from 2:30 PM until 10:00 PM.

  - Northstar operates a separate North Shore shuttle until Placer County begins winter TART service in mid-December. This normally operates every morning and evening from November 22nd through mid-December and from April 1st through April 20th. It is on stand-by during the evening hours on all weekends and holidays during the season.

- The Auto Drop-Off Zone is managed by one to two staff members from 7:30 AM until 4:00 PM.

Green Level Days

- Employee parking is located in Village View Lots E – K during the winter season to keep the parking spaces closer to the Village open for guests.

- Guest parking is provided at Village View Lots, Castle Peak Park and Ride Lots, and the Village Lower Pay Lots. Six buses serve these lots. The parking order for Village View Lots is Lot A through Lot K. Once the Village View Lots have reached capacity, the CMS is changed to direct guests into the Castle Peak Park and Ride Lots, starting at Lot 1.

- The following transit services are in operation:

  - The Northstar neighborhoods are served by five buses running from 8:00 AM until 5:00 PM, and three afternoon/evening buses running from 2:30 PM until 10:00 PM. This level typically occurs in the middle of the week when there are fewer homeowners or renters in the area.

  - Northstar operates a separate North Shore shuttle until Placer County begins winter TART service in mid-December. This normally operates every morning and evening from November 22nd through mid-December and from April 1st through April 20th. It is on stand-by during the evening hours on all weekends and holidays during the season.

  - The Auto Drop-Off Zone is managed by two to three staff members from 7:30 AM until 4:00 PM.

Yellow Level Days

- Employee parking is located in Village View Lots E – K during the winter season to keep the parking spaces closer to the Village open for guests.

- Guest parking is provided at Village View Lots, Castle Peak Park and Ride Lots, and the Village Lower Pay Lots. Between 9 and 12 buses serve these lots. The parking order for Village View Lots is Lot A through Lot K. Once the Village View Lots have reached capacity, the CMS is changed to direct guests into the Castle Peak Park and Ride Lots, starting at Lot 1.

- The following transit services are in operation:

    - The Northstar neighborhoods are served by eight to 12 buses operated from 8:00 AM until 5:00 PM and four afternoon/evening buses run from 2:30 PM until10:00 PM.

    - Northstar operates a separate North Shore shuttle until Placer County begins winter TART service in mid-December. This normally operates every morning and evening from November 22nd through mid-December and from April 1st through April 20th. It is on stand-by during the evening hours on all weekends and holidays during the season.

- The Transit Center is set up with posts and chains to help keep guests on the sidewalk.

- The Auto Drop-Off Zone is managed daily by two to three staff members from 7:30 AM until 4:00 PM.

- Two to three staff members serve as information hosts and manage the bus stops.

- Staff monitors the Northstar Drive Roundabout, the Northstar Drive/Big Springs Drive intersection, and the Currant Drive intersection.

Red Level Days

- Employee parking is located in Village View Lots E – K during the winter season to keep the parking spaces closer to the Village open for guests.

- Guest parking is provided at Village View Lots, Castle Peak Park and Ride Lots, Village Lower Pay Lots, and the Golf Course Lot. The parking order for Village View Lots is Lot A through Lot K. The parking order for Castle Peak Park and Ride Lots is Lot 1 through 18. When the Castle Peak Park and Ride Lots have reached capacity, vehicles are parked at the Golf Course Lot, which is served by transit.

- The following transit services are in operation:

    - The Northstar neighborhoods are served by 12-14 buses operated from 8:00 AM until 5:00 PM and five afternoon/evening buses operated from 2:30 PM until10:00 PM.

  - Northstar operates a separate North Shore shuttle until Placer County begins winter TART service in mid-December. This normally operates every morning and evening from November 22nd through mid-December and from April 1st through April 20th. It is on stand-by during the evening hours on all weekends and holidays during the season.

- The Transit Center is set up with posts and chains to help keep guests on the side walk and will be removed during storm cycles for snow removal.

- The Auto Drop-Off Zone is managed by three to four staff members from 7:30 AM until 5:00 PM.

- Three to four staff members serve as information hosts to manage the bus stops.

- Staff monitors the Northstar Drive roundabout, the Northstar Drive/Big Springs Drive intersection, and the Currant Drive intersection.

FUTURE CONSIDERATIONS AND MANAGEMENT STRATEGIES

In an effort to adapt to changing traffic and parking conditions and maintain a robust and effective Traffic and Parking Management Plan, Northstar implements the following strategies:

Strategies Within Northstar

- Continue to implement the California Air Resources Board (CARB) Emission Reduction Program schedule of compliance. This will result in removing less efficient diesel powered vehicles from the fleet and provide a cleaner, more efficient mass transit system for Northstar guests to enjoy.

- Support Placer County's proposed Northstar Drive Roundabout improvements, including widening, striping and signage improvements which are expected to improve roundabout efficiency and safety.

- Continue to evaluate the need for additional employee Park and Ride Lots to reduce Vehicle Miles Traveled and Level of Service impacts on local roadways.

- Based on the Northstar Highlands Conditional Use Permit (PSUB20040898), a detailed parking plan was to be developed to determine the need for additional onsite employee parking as a result of Highlands improvements. Northstar would like to see the Highlands applicants prepare this plan and construct employee parking as necessary per the Highlands improvements parking requirements. It should be noted that the Northstar Highlands Environmental Impact Report (EIR) includes a programmatic-level expanded employee parking lot adjacent to Northstar's existing administration building. Potential capacity for the employee lot is estimated to be approximately 300 spaces.

Strategies Connected to Northstar

- Continue to contribute $25,000 in annual funding to TART for Enhanced Winter Service on the SR 267 corridor. This has resulted in a $250,000 contribution over the last 10 years.

- Continue to provide leadership in developing and implementing regional transportation solutions by participating on local transportation and modality-centric groups including the: Truckee/North Tahoe Transportation Management Association, NLTRA Transportation/Infrastructure Committee, Truckee Tomorrow Transportation Committee, and the North Tahoe Transit Vision Committee.

- Maintain a positive working relationship with Caltrans to ensure that traffic light timing is optimized for Northstar guest ingress/egress during the peak winter period.

- Coordinate with Caltrans to utilize the existing changeable message signs on specific days located SR 267 and I-80 to inform Northstar guests on traffic and parking conditions.

- Consider expanding transportation services to local hotels during peak periods to reduce Vehicle Miles Traveled and Level of Service impacts.

- Continue to investigate developing regional shuttle service opportunities that will create a strong, seamless transportation link between the Reno/Tahoe International Airport and North and South Lake Tahoe.

- Investigate developing a marketing relationship with ZimRide or other ride sharing service that matches passengers with drivers visiting Lake Tahoe/Truckee, thereby reducing Vehicle Miles Traveled on the I-80 corridor.

APPENDIX C

Level of Service Descriptions

DESCRIPTIONS OF LEVELS OF SERVICE

The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level of service definition generally describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. Six levels of service are defined for each type of facility for which analysis procedures are available. They are given letter designations, from A to F, with level of service A representing the best operating conditions and level of service F the worst.

Level of Service Definitions

In general, the various levels of service are defined as follows for uninterrupted flow facilities:

- **Level of service A** represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

- **Level of service B** is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from LOS A. The level of comfort and convenience provided is somewhat less than at LOS A, because the presence of others in the traffic stream begins to affect individual behavior.

- **Level of service C** is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others, and maneuvering within the traffic stream requires substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably at this level.

- **Level of Service D** represents high-density, but stable, flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

- **Level of service E** represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to “give way” to accommodate such maneuvers. Comfort and convenience levels are extremely poor, and driver or pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor perturbations within the traffic stream will cause breakdowns.

- **Level of service F** is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level of service F is used to describe the operating conditions within the queue, as well as the point of the breakdown. It should be noted, however, that in many cases operating conditions of vehicles or pedestrians discharged from the queue may be quite good. Nevertheless, it is the point at which arrival flow exceeds discharge flow which causes the queue to form, and level of service F is an appropriate designation for such points.

APPENDIX D

Methodology of Assessment – Minimum LOS Memorandum

MEMORANDUM

DEPARTMENT OF PUBLIC WORKS
County of Placer

TO: Placer County Public Works DATE: March 8, 2011

FROM: Ken Grehm, Director KD

SUBJECT: **METHODOLOGY OF ASSESSMENT – MINIMUM LOS**

Placer County, along with surrounding jurisdictions, has experienced significant growth in recent years. This has led to an increase in traffic volumes and the demands for use of County roadways and intersections have outpaced the available construction activities to expand and improve existing infrastructure. As such, some of the existing transportation network within the County is occasionally overburdened and traffic operations have declined.

Achieving the level of service policy, as shown in the current Placer County General Plan, various Community Plans, and Specific Plans, remains the goal on all County facilities; however, given the overall decreases in operational efficiency throughout the County, proposed projects which will generate minimal traffic are more and more often expected to fund large improvements because nearby roadways or intersections already operate just within or below the County LOS policies. This can cause smaller projects to become economically infeasible within Placer County.

The County proposes to clarify the methodology of assessment of minimum level of service (LOS) for County roadway and intersections - as defined in the General Plan, various Community Plans, and Specific Plans within Place County - to ensure that mitigation measures are proportionate to the level of impact a specific project has on an intersection or roadway. The guidelines are as follows:

Traffic Impact Analysis:

If necessary, a traffic impact analysis shall be performed which includes Existing and Existing plus Project conditions at each Project location. Applicant/consultant shall determine scope of work with the County prior to completion of TIA.

Roadway Segments:

A project may be considered to exceed the minimum LOS policies if;

1) A roadway segment operating at or above the established Placer County policy without the project will decrease to an unacceptable LOS with the project; or

2) A roadway segment currently operating below the applicable established policy will experience an increase in V/C (volume to capacity) ratio of 0.05 or greater; or

3) A roadway segment experiences an increase in ADT of 100 or more project generated trips, per lane, and the LOS policy is exceeded.

Signalized Intersections:

A project may be considered to exceed the minimum LOS policies if;

1) An intersection operating at or above the established Placer County policies without the project will decrease to an unacceptable LOS with the project; or

2) An intersection currently operating below the acceptable LOS established policy will experience an increase in V/C (volume to capacity) ratio of 0.05 or greater; or

3) An intersection currently operating below the acceptable LOS policy will experience an increase in delay of 4 seconds or greater.

Unsignalized Intersections:

A project may be considered to exceed the minimum LOS policies if;

1) An unsignalized intersection which currently operates at or above the established Placer County policies without the project will deteriorate to an unacceptable LOS with the project; or

2) An unsignalized intersection which currently operates below the acceptable LOS established policy will experience an increase of 2.5 seconds or more with the project.

Further consideration will be given in situations where the existing level of service is just above or at the approved minimum level of service and any increase in vehicle trips, or even daily fluctuations in traffic, will deteriorate the level of service to an unacceptable level. In such cases, it may be determined by the County that part (2) or (3) of the above exceptions is more applicable and should be used to analyze a proposed project's impacts.

APPENDIX E

Level of Service Output

2012 Level of Service

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	161	97	76	404	615	126
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	386	178	101	1353	1097	933
Arrive On Green	0.11	0.11	0.06	0.73	0.59	0.59
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	169	102	80	425	647	133
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	2.3	3.0	2.2	4.0	10.8	1.9
Cycle Q Clear(g_c), s	2.3	3.0	2.2	4.0	10.8	1.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	386	178	101	1353	1097	933
V/C Ratio(X)	0.44	0.57	0.80	0.31	0.59	0.14
Avail Cap(c_a), veh/h	1111	511	143	1353	1097	933
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	20.5	20.9	23.1	2.4	6.4	4.6
Incr Delay (d2), s/veh	0.8	2.9	18.0	0.6	2.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (95%), veh/ln	1.7	0.3	2.4	1.0	6.1	0.8
Lane Grp Delay (d), s/veh	21.3	23.8	41.1	3.0	8.7	4.9
Lane Grp LOS	C	C	D	A	A	A
Approach Vol, veh/h	271			505	780	
Approach Delay, s/veh	22.2			9.0	8.1	
Approach LOS	C			A	A	

Timer					
Assigned Phs			5	2	6
Phs Duration (G+Y+Rc), s			6.8	40.0	33.2
Change Period (Y+Rc), s			4.0	4.0	4.0
Max Green Setting (Gmax), s			4.0	36.0	28.0
Max Q Clear Time (g_c+I1), s			4.2	6.0	12.8
Green Ext Time (p_c), s			0.0	7.3	5.7

Intersection Summary	
HCM 2010 Ctrl Delay	10.9
HCM 2010 LOS	B

Notes

Intersection	
Intersection Delay, s/veh	4.6
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	280	222	44	8
Demand Flow Rate, veh/h	286	226	45	8
Vehicles Circulating, veh/h	12	15	259	232
Vehicles Exiting, veh/h	228	289	39	9
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.8	4.4	3.9	3.4
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	4.200	4.200	4.200	4.200
Entry Flow, veh/h	286	226	45	8
Cap Entry Lane, veh/h	1274	1271	1051	1073
Entry HV Adj Factor	0.979	0.981	0.977	0.998
Flow Entry, veh/h	280	222	44	8
Cap Entry, veh/h	1247	1247	1027	1071
V/C Ratio	0.225	0.178	0.043	0.007
Control Delay, s/veh	4.8	4.4	3.9	3.4
LOS	A	A	A	A
95th %tile Queue, veh	1	1	0	0

Intersection	
Intersection Delay, s/veh	8.9
Intersection LOS	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	57	20	43	157	171	66
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	59	21	45	164	178	69
Number of Lanes	1	0	1	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	2
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	2	0	1
HCM Control Delay	8.6	8.9	9.1
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	SBLn1
Vol Left, %	100%	0%	74%	0%
Vol Thru, %	0%	100%	0%	72%
Vol Right, %	0%	0%	26%	28%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	43	157	77	237
LT Vol	0	157	0	171
Through Vol	0	0	20	66
RT Vol	43	0	57	0
Lane Flow Rate	45	164	80	247
Geometry Grp	7	7	2	5
Degree of Util (X)	0.067	0.223	0.11	0.295
Departure Headway (Hd)	5.418	4.915	4.947	4.307
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	663	733	725	837
Service Time	3.137	2.635	2.974	2.324
HCM Lane V/C Ratio	0.068	0.224	0.11	0.295
HCM Control Delay	8.5	9	8.6	9.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.9	0.4	1.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	866	520	91	307	390	193
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	1170	538	127	931	649	551
Arrive On Green	0.34	0.34	0.07	0.50	0.35	0.35
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	952	571	100	337	429	212
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	12.6	17.0	2.8	5.5	9.8	5.0
Cycle Q Clear(g_c), s	12.6	17.0	2.8	5.5	9.8	5.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1170	538	127	931	649	551
V/C Ratio(X)	0.81	1.06	0.79	0.36	0.66	0.38
Avail Cap(c_a), veh/h	1170	538	177	931	649	551
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	15.1	16.5	22.8	7.6	13.8	12.3
Incr Delay (d2), s/veh	4.5	55.9	14.3	1.1	5.2	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	5.4	20.6	1.6	1.9	4.3	1.8
Lane Grp Delay (d), s/veh	19.6	72.4	37.1	8.7	19.0	14.3
Lane Grp LOS	B	F	D	A	B	B
Approach Vol, veh/h	1523			437	641	
Approach Delay, s/veh	39.4			15.2	17.5	
Approach LOS	D			B	B	

Timer			
Assigned Phs	5	2	6
Phs Duration (G+Y+Rc), s	7.6	29.0	21.4
Change Period (Y+Rc), s	4.0	4.0	4.0
Max Green Setting (Gmax), s	5.0	25.0	16.0
Max Q Clear Time (g_c+I1), s	4.8	7.5	11.8
Green Ext Time (p_c), s	0.0	4.4	1.9

Intersection Summary	
HCM 2010 Ctrl Delay	29.9
HCM 2010 LOS	C

Notes

Intersection	
Intersection Delay, s/veh	11.1
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	2	1	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1085	296	221	450
Demand Flow Rate, veh/h	1107	302	226	459
Vehicles Circulating, veh/h	404	116	1363	334
Vehicles Exiting, veh/h	389	1473	148	84
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	11.9	5.5	19.0	9.2
Approach LOS	B	A	C	A

Lane	Left	Right	Left	Left	Left
Designated Moves	LT	TR	LTR	LTR	LTR
Assumed Moves	LT	TR	LTR	LTR	LTR
RT Channelized					
Lane Util	0.470	0.530	1.000	1.000	1.000
Critical Headway, s	4.000	4.000	4.200	4.200	4.200
Entry Flow, veh/h	520	587	302	226	459
Cap Entry Lane, veh/h	960	960	1175	445	992
Entry HV Adj Factor	0.981	0.980	0.982	0.980	0.981
Flow Entry, veh/h	510	575	296	221	450
Cap Entry, veh/h	942	941	1153	436	973
V/C Ratio	0.541	0.611	0.257	0.507	0.463
Control Delay, s/veh	10.9	12.7	5.5	19.0	9.2
LOS	B	B	A	C	A
95th %tile Queue, veh	3	4	1	3	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	382	112	71	591	335	66
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	190.0
Lanes	1	1	1	1	1	0
Cap, veh/h	670	598	177	993	589	115
Arrive On Green	0.38	0.38	0.10	0.53	0.39	0.39
Sat Flow, veh/h	1774	1583	1774	1863	1514	296
Grp Volume(v), veh/h	402	118	75	622	0	422
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1863	0	1811
Q Serve(g_s), s	16.4	4.5	3.6	21.1	0.0	16.7
Cycle Q Clear(g_c), s	16.4	4.5	3.6	21.1	0.0	16.7
Prop In Lane	1.00	1.00	1.00			0.16
Lane Grp Cap(c), veh/h	670	598	177	993	0	704
V/C Ratio(X)	0.60	0.20	0.42	0.63	0.00	0.60
Avail Cap(c_a), veh/h	670	598	177	993	0	704
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.5	18.8	38.1	14.7	0.0	21.9
Incr Delay (d2), s/veh	3.9	0.7	7.2	3.0	0.0	3.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	7.8	4.9	2.0	9.8	0.0	8.0
Lane Grp Delay (d), s/veh	26.5	19.6	45.3	17.7	0.0	25.7
Lane Grp LOS	C	B	D	B		C
Approach Vol, veh/h	520			697	422	
Approach Delay, s/veh	24.9			20.7	25.7	
Approach LOS	C			C	C	

Timer					
Assigned Phs			5	2	6
Phs Duration (G+Y+Rc), s			13.0	52.0	39.0
Change Period (Y+Rc), s			4.0	4.0	4.0
Max Green Setting (Gmax), s			9.0	48.0	35.0
Max Q Clear Time (g_c+I1), s			5.6	23.1	18.7
Green Ext Time (p_c), s			0.0	7.8	6.5

Intersection Summary	
HCM 2010 Ctrl Delay	23.3
HCM 2010 LOS	C

Notes

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	162	97	77	404	615	127
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	387	178	102	1353	1095	931
Arrive On Green	0.11	0.11	0.06	0.73	0.59	0.59
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	171	102	81	425	647	134
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	2.3	3.0	2.2	4.0	10.9	1.9
Cycle Q Clear(g_c), s	2.3	3.0	2.2	4.0	10.9	1.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	387	178	102	1353	1095	931
V/C Ratio(X)	0.44	0.57	0.79	0.31	0.59	0.14
Avail Cap(c_a), veh/h	1111	511	143	1353	1095	931
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	20.5	20.9	23.1	2.4	6.4	4.6
Incr Delay (d2), s/veh	0.8	2.9	18.3	0.6	2.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.9	0.1	1.3	0.6	3.4	0.5
Lane Grp Delay (d), s/veh	21.3	23.8	41.3	3.0	8.8	4.9
Lane Grp LOS	C	C	D	A	A	A
Approach Vol, veh/h	273			506	781	
Approach Delay, s/veh	22.2			9.1	8.1	
Approach LOS	C			A	A	
Timer						
Assigned Phs			5	2	6	
Phs Duration (G+Y+Rc), s			6.8	40.0	33.2	
Change Period (Y+Rc), s			4.0	4.0	4.0	
Max Green Setting (Gmax), s			4.0	36.0	28.0	
Max Q Clear Time (g_c+I1), s			4.2	6.0	12.9	
Green Ext Time (p_c), s			0.0	7.3	5.7	
Intersection Summary						
HCM 2010 Ctrl Delay			10.9			
HCM 2010 LOS			B			
Notes						

Intersection	
Intersection Delay, s/veh	4.6
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	281	224	44	8
Demand Flow Rate, veh/h	287	228	45	8
Vehicles Circulating, veh/h	12	15	260	234
Vehicles Exiting, veh/h	230	290	39	9
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.8	4.4	3.9	3.4
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	4.200	4.200	4.200	4.200
Entry Flow, veh/h	287	228	45	8
Cap Entry Lane, veh/h	1274	1271	1050	1072
Entry HV Adj Factor	0.979	0.981	0.977	0.998
Flow Entry, veh/h	281	224	44	8
Cap Entry, veh/h	1247	1247	1027	1069
V/C Ratio	0.225	0.179	0.043	0.007
Control Delay, s/veh	4.8	4.4	3.9	3.4
LOS	A	A	A	A
95th %tile Queue, veh	1	1	0	0

Intersection	
Intersection Delay, s/veh	9
Intersection LOS	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	57	20	43	158	173	66
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	59	21	45	165	180	69
Number of Lanes	1	0	1	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	2
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	2	0	1
HCM Control Delay	8.6	9	9.2
HCM LOS	A	A	A

Lane	NBLn1	NBLn2	EBLn1	SBLn1
Vol Left, %	100%	0%	74%	0%
Vol Thru, %	0%	100%	0%	72%
Vol Right, %	0%	0%	26%	28%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	43	158	77	239
LT Vol	0	158	0	173
Through Vol	0	0	20	66
RT Vol	43	0	57	0
Lane Flow Rate	45	165	80	249
Geometry Grp	7	7	2	5
Degree of Util (X)	0.067	0.225	0.11	0.298
Departure Headway (Hd)	5.42	4.917	4.956	4.31
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	662	732	723	837
Service Time	3.139	2.637	2.983	2.327
HCM Lane V/C Ratio	0.068	0.225	0.111	0.297
HCM Control Delay	8.5	9.1	8.6	9.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.9	0.4	1.3

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	883	529	93	307	390	196
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	1170	538	130	931	646	549
Arrive On Green	0.34	0.34	0.07	0.50	0.35	0.35
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	970	581	102	337	429	215
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	13.0	17.0	2.8	5.5	9.8	5.1
Cycle Q Clear(g_c), s	13.0	17.0	2.8	5.5	9.8	5.1
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1170	538	130	931	646	549
V/C Ratio(X)	0.83	1.08	0.79	0.36	0.66	0.39
Avail Cap(c_a), veh/h	1170	538	177	931	646	549
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	15.2	16.5	22.8	7.6	13.9	12.3
Incr Delay (d2), s/veh	5.1	61.9	14.7	1.1	5.3	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	5.7	21.5	1.6	1.9	4.3	1.8
Lane Grp Delay (d), s/veh	20.3	78.4	37.5	8.7	19.2	14.4
Lane Grp LOS	C	F	D	A	B	B
Approach Vol, veh/h	1551			439	644	
Approach Delay, s/veh	42.1			15.4	17.6	
Approach LOS	D			B	B	
Timer						
Assigned Phs			5	2	6	
Phs Duration (G+Y+Rc), s			7.7	29.0	21.3	
Change Period (Y+Rc), s			4.0	4.0	4.0	
Max Green Setting (Gmax), s			5.0	25.0	16.0	
Max Q Clear Time (g_c+I1), s			4.8	7.5	11.8	
Green Ext Time (p_c), s			0.0	4.4	1.9	
Intersection Summary						
HCM 2010 Ctrl Delay			31.6			
HCM 2010 LOS			C			
Notes						

Intersection	
Intersection Delay, s/veh	11.4
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	2	1	1	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1112	301	221	450
Demand Flow Rate, veh/h	1134	307	226	459
Vehicles Circulating, veh/h	404	116	1390	339
Vehicles Exiting, veh/h	394	1500	148	84
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	12.2	5.5	19.7	9.2
Approach LOS	B	A	C	A

Lane	Left	Right	Left	Left	Left
Designated Moves	LT	TR	LTR	LTR	LTR
Assumed Moves	LT	TR	LTR	LTR	LTR
RT Channelized					
Lane Util	0.470	0.530	1.000	1.000	1.000
Critical Headway, s	4.000	4.000	4.200	4.200	4.200
Entry Flow, veh/h	533	601	307	226	459
Cap Entry Lane, veh/h	960	960	1175	436	988
Entry HV Adj Factor	0.980	0.980	0.982	0.980	0.981
Flow Entry, veh/h	522	589	301	221	450
Cap Entry, veh/h	941	941	1153	427	969
V/C Ratio	0.555	0.626	0.261	0.518	0.465
Control Delay, s/veh	11.3	13.1	5.5	19.7	9.2
LOS	B	B	A	C	A
95th %tile Queue, veh	4	5	1	3	3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	395	112	71	604	340	66
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	190.0
Lanes	1	1	1	1	1	0
Cap, veh/h	670	598	177	993	591	114
Arrive On Green	0.38	0.38	0.10	0.53	0.39	0.39
Sat Flow, veh/h	1774	1583	1774	1863	1518	293
Grp Volume(v), veh/h	416	118	75	636	0	427
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1863	0	1811
Q Serve(g_s), s	17.2	4.5	3.6	21.8	0.0	17.0
Cycle Q Clear(g_c), s	17.2	4.5	3.6	21.8	0.0	17.0
Prop In Lane	1.00	1.00	1.00			0.16
Lane Grp Cap(c), veh/h	670	598	177	993	0	704
V/C Ratio(X)	0.62	0.20	0.42	0.64	0.00	0.61
Avail Cap(c_a), veh/h	670	598	177	993	0	704
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.8	18.8	38.1	14.9	0.0	22.0
Incr Delay (d2), s/veh	4.3	0.7	7.2	3.2	0.0	3.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	8.2	4.9	2.0	10.2	0.0	8.1
Lane Grp Delay (d), s/veh	27.0	19.6	45.3	18.0	0.0	25.8
Lane Grp LOS	C	B	D	B		C
Approach Vol, veh/h	534			711	427	
Approach Delay, s/veh	25.4			20.9	25.8	
Approach LOS	C			C	C	

Timer			
Assigned Phs	5	2	6
Phs Duration (G+Y+Rc), s	13.0	52.0	39.0
Change Period (Y+Rc), s	4.0	4.0	4.0
Max Green Setting (Gmax), s	9.0	48.0	35.0
Max Q Clear Time (g_c+I1), s	5.6	23.8	19.0
Green Ext Time (p_c), s	0.0	7.9	6.5

Intersection Summary	
HCM 2010 Ctrl Delay	23.6
HCM 2010 LOS	C

Notes

2032 Level of Service

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	231	163	115	906	1157	167
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	470	216	124	1434	1217	1034
Arrive On Green	0.14	0.14	0.07	0.77	0.65	0.65
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	243	172	121	954	1218	176
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	5.6	9.0	5.8	20.7	56.0	3.7
Cycle Q Clear(g_c), s	5.6	9.0	5.8	20.7	56.0	3.7
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	470	216	124	1434	1217	1034
V/C Ratio(X)	0.52	0.79	0.97	0.67	1.00	0.17
Avail Cap(c_a), veh/h	642	296	124	1434	1217	1034
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	34.4	35.8	39.8	4.6	14.9	5.8
Incr Delay (d2), s/veh	0.9	10.0	72.5	2.5	26.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.5	0.6	5.0	5.7	27.0	1.1
Lane Grp Delay (d), s/veh	35.3	45.9	112.3	7.1	40.8	6.2
Lane Grp LOS	D	D	F	A	F	A
Approach Vol, veh/h	415			1075	1394	
Approach Delay, s/veh	39.6			18.9	36.5	
Approach LOS	D			B	D	
Timer						
Assigned Phs			5	2	6	
Phs Duration (G+Y+Rc), s			10.0	70.0	60.0	
Change Period (Y+Rc), s			4.0	4.0	4.0	
Max Green Setting (Gmax), s			6.0	66.0	56.0	
Max Q Clear Time (g_c+I1), s			7.8	22.7	58.0	
Green Ext Time (p_c), s			0.0	27.2	0.0	
Intersection Summary						
HCM 2010 Ctrl Delay			30.4			
HCM 2010 LOS			C			
Notes						

Intersection	
Intersection Delay, s/veh	4.1
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	409	296	61	10
Demand Flow Rate, veh/h	417	302	62	10
Vehicles Circulating, veh/h	15	21	381	310
Vehicles Exiting, veh/h	305	422	51	13
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.3	3.9	4.1	3.6
Approach LOS	A	A	A	A

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	TR	LT	TR	LT	R	L	LTR
Assumed Moves	LT	TR	LT	TR	LT	R	L	LTR
RT Channelized								
Lane Util	0.470	0.530	0.470	0.530	0.242	0.758	0.500	0.500
Critical Headway, s	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Entry Flow, veh/h	196	221	142	160	15	47	5	5
Cap Entry Lane, veh/h	1272	1272	1266	1266	976	976	1028	1028
Entry HV Adj Factor	0.980	0.980	0.981	0.982	0.999	0.979	1.058	0.938
Flow Entry, veh/h	192	217	139	157	15	46	5	5
Cap Entry, veh/h	1247	1247	1242	1243	975	956	1087	964
V/C Ratio	0.154	0.174	0.112	0.126	0.015	0.048	0.005	0.005
Control Delay, s/veh	4.2	4.4	3.8	3.9	3.8	4.2	3.4	3.8
LOS	A	A	A	A	A	A	A	A
95th %tile Queue, veh	1	1	0	0	0	0	0	0

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	88	29	63	243	228	88
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	92	30	66	253	238	92
Number of Lanes	1	0	1	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	2
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	2	0	1
HCM Control Delay	9.7	10.4	10.9
HCM LOS	A	B	B

Lane	NBLn1	NBLn2	EBLn1	SBLn1
Vol Left, %	100%	0%	75%	0%
Vol Thru, %	0%	100%	0%	72%
Vol Right, %	0%	0%	25%	28%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	63	243	117	316
LT Vol	0	243	0	228
Through Vol	0	0	29	88
RT Vol	63	0	88	0
Lane Flow Rate	66	253	122	329
Geometry Grp	7	7	2	5
Degree of Util (X)	0.103	0.361	0.182	0.418
Departure Headway (Hd)	5.632	5.128	5.389	4.568
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	635	699	662	787
Service Time	3.379	2.876	3.452	2.612
HCM Lane V/C Ratio	0.104	0.362	0.184	0.418
HCM Control Delay	9	10.8	9.7	10.9
HCM Lane LOS	A	B	A	B
HCM 95th-tile Q	0.3	1.6	0.7	2.1

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	927	557	145	448	569	304
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	1101	507	177	969	633	538
Arrive On Green	0.32	0.32	0.10	0.52	0.34	0.34
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	976	586	153	472	599	320
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	13.5	16.0	4.2	8.1	15.6	8.4
Cycle Q Clear(g_c), s	13.5	16.0	4.2	8.1	15.6	8.4
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1101	507	177	969	633	538
V/C Ratio(X)	0.89	1.16	0.86	0.49	0.95	0.59
Avail Cap(c_a), veh/h	1101	507	177	969	633	538
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	16.1	17.0	22.2	7.7	16.1	13.6
Incr Delay (d2), s/veh	8.9	90.8	32.7	1.8	24.7	4.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (95%), veh/ln	10.5	35.6	5.7	4.9	14.8	5.6
Lane Grp Delay (d), s/veh	25.0	107.8	54.8	9.5	40.7	18.4
Lane Grp LOS	C	F	D	A	D	B
Approach Vol, veh/h	1562			625	919	
Approach Delay, s/veh	56.1			20.6	33.0	
Approach LOS	E			C	C	

Timer						
Assigned Phs			5	2	6	
Phs Duration (G+Y+Rc), s			9.0	30.0	21.0	
Change Period (Y+Rc), s			4.0	4.0	4.0	
Max Green Setting (Gmax), s			5.0	26.0	17.0	
Max Q Clear Time (g_c+I1), s			6.2	10.1	17.6	
Green Ext Time (p_c), s			0.0	6.5	0.0	

Intersection Summary						
HCM 2010 Ctrl Delay			42.1			
HCM 2010 LOS			D			

Notes

Intersection	
Intersection Delay, s/veh	11.2
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1132	468	256	567
Demand Flow Rate, veh/h	1154	477	261	579
Vehicles Circulating, veh/h	505	153	1469	520
Vehicles Exiting, veh/h	594	1577	190	110
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	14.7	5.1	14.2	7.8
Approach LOS	B	A	B	A

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	TR	LT	TR	LT	R	L	LTR
Assumed Moves	LT	TR	LT	TR	LT	R	L	LTR
RT Channelized								
Lane Util	0.470	0.530	0.470	0.530	0.318	0.682	0.530	0.470
Critical Headway, s	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Entry Flow, veh/h	542	612	224	253	83	178	307	272
Cap Entry Lane, veh/h	893	893	1151	1151	445	445	883	883
Entry HV Adj Factor	0.982	0.980	0.982	0.981	0.980	0.983	0.979	0.980
Flow Entry, veh/h	532	600	220	248	81	175	301	266
Cap Entry, veh/h	876	875	1131	1129	436	438	864	865
V/C Ratio	0.607	0.685	0.195	0.220	0.187	0.400	0.348	0.308
Control Delay, s/veh	13.3	16.0	4.9	5.2	11.1	15.6	8.1	7.5
LOS	B	C	A	A	B	C	A	A
95th %tile Queue, veh	4	6	1	1	1	2	2	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	447	131	194	611	442	87
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	190.0
Lanes	1	1	1	1	1	0
Cap, veh/h	572	510	276	1097	588	116
Arrive On Green	0.32	0.32	0.16	0.59	0.39	0.39
Sat Flow, veh/h	1774	1583	1774	1863	1511	299
Grp Volume(v), veh/h	471	138	204	643	0	557
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1863	0	1810
Q Serve(g_s), s	22.0	5.8	9.9	19.5	0.0	24.4
Cycle Q Clear(g_c), s	22.0	5.8	9.9	19.5	0.0	24.4
Prop In Lane	1.00	1.00	1.00			0.17
Lane Grp Cap(c), veh/h	572	510	276	1097	0	704
V/C Ratio(X)	0.82	0.27	0.74	0.59	0.00	0.79
Avail Cap(c_a), veh/h	572	510	276	1097	0	704
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.1	22.6	36.3	11.6	0.0	24.3
Incr Delay (d2), s/veh	12.7	1.3	16.2	2.3	0.0	8.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (95%), veh/ln	17.1	9.9	9.5	13.6	0.0	18.2
Lane Grp Delay (d), s/veh	40.8	23.9	52.5	13.9	0.0	33.1
Lane Grp LOS	D	C	D	B		C
Approach Vol, veh/h	609			847	557	
Approach Delay, s/veh	37.0			23.2	33.1	
Approach LOS	D			C	C	

Timer			
Assigned Phs	5	2	6
Phs Duration (G+Y+Rc), s	18.0	57.0	39.0
Change Period (Y+Rc), s	4.0	4.0	4.0
Max Green Setting (Gmax), s	14.0	53.0	35.0
Max Q Clear Time (g_c+I1), s	11.9	21.5	26.4
Green Ext Time (p_c), s	0.1	10.1	4.9

Intersection Summary	
HCM 2010 Ctrl Delay	30.1
HCM 2010 LOS	C

Notes

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	232	163	116	906	1157	168
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	470	216	124	1434	1217	1034
Arrive On Green	0.14	0.14	0.07	0.77	0.65	0.65
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	244	172	122	954	1218	177
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	5.6	9.0	5.9	20.7	56.0	3.7
Cycle Q Clear(g_c), s	5.6	9.0	5.9	20.7	56.0	3.7
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	470	216	124	1434	1217	1034
V/C Ratio(X)	0.52	0.79	0.98	0.67	1.00	0.17
Avail Cap(c_a), veh/h	642	296	124	1434	1217	1034
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	34.4	35.8	39.8	4.6	14.9	5.8
Incr Delay (d2), s/veh	0.9	10.0	75.1	2.5	26.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (95%), veh/ln	4.5	1.1	8.8	9.7	35.6	2.0
Lane Grp Delay (d), s/veh	35.3	45.9	114.9	7.1	40.9	6.2
Lane Grp LOS	D	D	F	A	F	A
Approach Vol, veh/h	416			1076	1395	
Approach Delay, s/veh	39.6			19.3	36.5	
Approach LOS	D			B	D	

Timer					
Assigned Phs			5	2	6
Phs Duration (G+Y+Rc), s			10.0	70.0	60.0
Change Period (Y+Rc), s			4.0	4.0	4.0
Max Green Setting (Gmax), s			6.0	66.0	56.0
Max Q Clear Time (g_c+I1), s			7.9	22.7	58.0
Green Ext Time (p_c), s			0.0	27.2	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	30.5
HCM 2010 LOS	C

Notes

Intersection	
Intersection Delay, s/veh	4.1
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	410	298	61	10
Demand Flow Rate, veh/h	418	304	62	10
Vehicles Circulating, veh/h	15	21	382	312
Vehicles Exiting, veh/h	307	423	51	13
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.3	3.9	4.1	3.6
Approach LOS	A	A	A	A

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	TR	LT	TR	LT	R	L	LTR
Assumed Moves	LT	TR	LT	TR	LT	R	L	LTR
RT Channelized								
Lane Util	0.469	0.531	0.470	0.530	0.242	0.758	0.500	0.500
Critical Headway, s	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Entry Flow, veh/h	196	222	143	161	15	47	5	5
Cap Entry Lane, veh/h	1272	1272	1266	1266	976	976	1026	1026
Entry HV Adj Factor	0.983	0.978	0.980	0.982	0.999	0.979	1.058	0.938
Flow Entry, veh/h	193	217	140	158	15	46	5	5
Cap Entry, veh/h	1250	1244	1242	1244	974	955	1086	963
V/C Ratio	0.154	0.175	0.113	0.127	0.015	0.048	0.005	0.005
Control Delay, s/veh	4.2	4.4	3.8	4.0	3.8	4.2	3.4	3.8
LOS	A	A	A	A	A	A	A	A
95th %tile Queue, veh	1	1	0	0	0	0	0	0

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	88	29	63	244	230	88
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	92	30	66	254	240	92
Number of Lanes	1	0	1	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	2
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	2	0	1
HCM Control Delay	9.7	10.4	10.9
HCM LOS	A	B	B

Lane	NBLn1	NBLn2	EBLn1	SBLn1
Vol Left, %	100%	0%	75%	0%
Vol Thru, %	0%	100%	0%	72%
Vol Right, %	0%	0%	25%	28%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	63	244	117	318
LT Vol	0	244	0	230
Through Vol	0	0	29	88
RT Vol	63	0	88	0
Lane Flow Rate	66	254	122	331
Geometry Grp	7	7	2	5
Degree of Util (X)	0.103	0.362	0.183	0.421
Departure Headway (Hd)	5.633	5.13	5.394	4.57
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	635	699	662	785
Service Time	3.384	2.88	3.459	2.616
HCM Lane V/C Ratio	0.104	0.363	0.184	0.422
HCM Control Delay	9	10.8	9.7	10.9
HCM Lane LOS	A	B	A	B
HCM 95th-tile Q	0.3	1.7	0.7	2.1

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	944	566	147	448	569	307
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	1090	501	177	1025	714	607
Arrive On Green	0.32	0.32	0.10	0.55	0.38	0.38
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	994	596	155	472	599	323
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	16.7	19.0	5.2	9.2	17.5	9.5
Cycle Q Clear(g_c), s	16.7	19.0	5.2	9.2	17.5	9.5
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1090	501	177	1025	714	607
V/C Ratio(X)	0.91	1.19	0.87	0.46	0.84	0.53
Avail Cap(c_a), veh/h	1090	501	177	1025	714	607
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	19.7	20.5	26.6	8.1	16.8	14.3
Incr Delay (d2), s/veh	11.5	103.5	34.9	1.5	11.3	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (95%), veh/ln	12.9	41.2	6.7	5.7	13.4	6.2
Lane Grp Delay (d), s/veh	31.1	124.0	61.5	9.6	28.2	17.7
Lane Grp LOS	C	F	E	A	C	B
Approach Vol, veh/h	1590			627	922	
Approach Delay, s/veh	65.9			22.5	24.5	
Approach LOS	E			C	C	

Timer						
Assigned Phs			5	2	6	
Phs Duration (G+Y+Rc), s			10.0	37.0	27.0	
Change Period (Y+Rc), s			4.0	4.0	4.0	
Max Green Setting (Gmax), s			6.0	33.0	23.0	
Max Q Clear Time (g_c+I1), s			7.2	11.2	19.5	
Green Ext Time (p_c), s			0.0	7.4	2.2	

Intersection Summary						
HCM 2010 Ctrl Delay			45.1			
HCM 2010 LOS			D			

Notes

Intersection	
Intersection Delay, s/veh	11.5
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1159	473	256	567
Demand Flow Rate, veh/h	1181	482	261	579
Vehicles Circulating, veh/h	505	153	1496	525
Vehicles Exiting, veh/h	599	1604	190	110
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	15.3	5.1	14.6	7.9
Approach LOS	C	A	B	A

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	TR	LT	TR	LT	R	L	LTR
Assumed Moves	LT	TR	LT	TR	LT	R	L	LTR
RT Channelized								
Lane Util	0.470	0.530	0.471	0.529	0.318	0.682	0.530	0.470
Critical Headway, s	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Entry Flow, veh/h	555	626	227	255	83	178	307	272
Cap Entry Lane, veh/h	893	893	1151	1151	436	436	880	880
Entry HV Adj Factor	0.981	0.981	0.979	0.983	0.980	0.983	0.979	0.980
Flow Entry, veh/h	545	614	222	251	81	175	301	266
Cap Entry, veh/h	876	876	1127	1132	428	429	861	862
V/C Ratio	0.622	0.701	0.197	0.222	0.190	0.408	0.349	0.309
Control Delay, s/veh	13.7	16.7	5.0	5.2	11.3	16.1	8.1	7.6
LOS	B	C	A	A	B	C	A	A
95th %tile Queue, veh	4	6	1	1	1	2	2	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	460	131	194	624	447	87
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	190.0
Lanes	1	1	1	1	1	0
Cap, veh/h	591	528	276	1076	572	112
Arrive On Green	0.33	0.33	0.16	0.58	0.38	0.38
Sat Flow, veh/h	1774	1583	1774	1863	1515	296
Grp Volume(v), veh/h	484	138	204	657	0	563
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1863	0	1811
Q Serve(g_s), s	22.5	5.7	9.9	20.7	0.0	25.3
Cycle Q Clear(g_c), s	22.5	5.7	9.9	20.7	0.0	25.3
Prop In Lane	1.00	1.00	1.00			0.16
Lane Grp Cap(c), veh/h	591	528	276	1076	0	684
V/C Ratio(X)	0.82	0.26	0.74	0.61	0.00	0.82
Avail Cap(c_a), veh/h	591	528	276	1076	0	684
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.5	21.9	36.3	12.4	0.0	25.3
Incr Delay (d2), s/veh	12.0	1.2	16.2	2.6	0.0	10.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (95%), veh/ln	17.2	9.9	9.5	14.4	0.0	19.1
Lane Grp Delay (d), s/veh	39.5	23.1	52.5	15.0	0.0	36.1
Lane Grp LOS	D	C	D	B		D
Approach Vol, veh/h	622			861	563	
Approach Delay, s/veh	35.8			23.9	36.1	
Approach LOS	D			C	D	
Timer						
Assigned Phs			5	2	6	
Phs Duration (G+Y+Rc), s			18.0	56.0	38.0	
Change Period (Y+Rc), s			4.0	4.0	4.0	
Max Green Setting (Gmax), s			14.0	52.0	34.0	
Max Q Clear Time (g_c+I1), s			11.9	22.7	27.3	
Green Ext Time (p_c), s			0.1	10.1	4.1	
Intersection Summary						
HCM 2010 Ctrl Delay			30.9			
HCM 2010 LOS			C			
Notes						

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	238	167	117	906	1157	170
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	478	220	124	1430	1214	1032
Arrive On Green	0.14	0.14	0.07	0.77	0.65	0.65
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	251	176	123	954	1218	179
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	5.8	9.3	6.0	20.9	56.0	3.8
Cycle Q Clear(g_c), s	5.8	9.3	6.0	20.9	56.0	3.8
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	478	220	124	1430	1214	1032
V/C Ratio(X)	0.52	0.80	0.99	0.67	1.00	0.17
Avail Cap(c_a), veh/h	641	295	124	1430	1214	1032
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	34.4	35.8	40.0	4.7	15.0	5.9
Incr Delay (d2), s/veh	0.9	10.7	78.6	2.5	26.7	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (95%), veh/ln	4.6	1.2	9.0	9.7	35.9	2.1
Lane Grp Delay (d), s/veh	35.3	46.6	118.6	7.2	41.7	6.2
Lane Grp LOS	D	D	F	A	F	A
Approach Vol, veh/h	427			1077	1397	
Approach Delay, s/veh	39.9			19.9	37.1	
Approach LOS	D			B	D	

Timer					
Assigned Phs			5	2	6
Phs Duration (G+Y+Rc), s			10.0	70.0	60.0
Change Period (Y+Rc), s			4.0	4.0	4.0
Max Green Setting (Gmax), s			6.0	66.0	56.0
Max Q Clear Time (g_c+I1), s			8.0	22.9	58.0
Green Ext Time (p_c), s			0.0	27.1	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	31.2
HCM 2010 LOS	C

Notes

Intersection	
Intersection Delay, s/veh	4.1
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	421	301	61	10
Demand Flow Rate, veh/h	429	307	62	10
Vehicles Circulating, veh/h	15	21	393	315
Vehicles Exiting, veh/h	310	434	51	13
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.3	3.9	4.1	3.6
Approach LOS	A	A	A	A

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	TR	LT	TR	LT	R	L	LTR
Assumed Moves	LT	TR	LT	TR	LT	R	L	LTR
RT Channelized								
Lane Util	0.471	0.529	0.469	0.531	0.242	0.758	0.500	0.500
Critical Headway, s	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Entry Flow, veh/h	202	227	144	163	15	47	5	5
Cap Entry Lane, veh/h	1272	1272	1266	1266	968	968	1024	1024
Entry HV Adj Factor	0.978	0.982	0.983	0.980	0.999	0.979	1.058	0.938
Flow Entry, veh/h	198	223	142	160	15	46	5	5
Cap Entry, veh/h	1244	1249	1245	1240	967	947	1083	961
V/C Ratio	0.159	0.178	0.114	0.129	0.015	0.049	0.005	0.005
Control Delay, s/veh	4.2	4.4	3.8	4.0	3.9	4.2	3.4	3.8
LOS	A	A	A	A	A	A	A	A
95th %tile Queue, veh	1	1	0	0	0	0	0	0

Intersection	
Intersection Delay, s/veh	10.6
Intersection LOS	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	88	29	63	254	233	88
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	92	30	66	265	243	92
Number of Lanes	1	0	1	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	2
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	2	0	1
HCM Control Delay	9.7	10.6	11
HCM LOS	A	B	B

Lane	NBLn1	NBLn2	EBLn1	SBLn1
Vol Left, %	100%	0%	75%	0%
Vol Thru, %	0%	100%	0%	73%
Vol Right, %	0%	0%	25%	27%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	63	254	117	321
LT Vol	0	254	0	233
Through Vol	0	0	29	88
RT Vol	63	0	88	0
Lane Flow Rate	66	265	122	334
Geometry Grp	7	7	2	5
Degree of Util (X)	0.103	0.377	0.184	0.426
Departure Headway (Hd)	5.639	5.135	5.423	4.585
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	634	699	658	782
Service Time	3.389	2.886	3.49	2.632
HCM Lane V/C Ratio	0.104	0.379	0.185	0.427
HCM Control Delay	9	11	9.7	11
HCM Lane LOS	A	B	A	B
HCM 95th-tile Q	0.3	1.8	0.7	2.1

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	238	167	118	906	1157	172
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	478	220	124	1430	1214	1032
Arrive On Green	0.14	0.14	0.07	0.77	0.65	0.65
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	251	176	124	954	1218	181
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	5.8	9.3	6.0	20.9	56.0	3.9
Cycle Q Clear(g_c), s	5.8	9.3	6.0	20.9	56.0	3.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	478	220	124	1430	1214	1032
V/C Ratio(X)	0.52	0.80	1.00	0.67	1.00	0.18
Avail Cap(c_a), veh/h	641	295	124	1430	1214	1032
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	34.4	35.8	40.0	4.7	15.0	5.9
Incr Delay (d2), s/veh	0.9	10.7	81.2	2.5	26.7	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (95%), veh/ln	4.6	1.2	9.1	9.7	35.9	2.1
Lane Grp Delay (d), s/veh	35.3	46.6	121.2	7.2	41.7	6.3
Lane Grp LOS	D	D	F	A	F	A
Approach Vol, veh/h	427			1078	1399	
Approach Delay, s/veh	39.9			20.3	37.1	
Approach LOS	D			C	D	

Timer					
Assigned Phs			5	2	6
Phs Duration (G+Y+Rc), s			10.0	70.0	60.0
Change Period (Y+Rc), s			4.0	4.0	4.0
Max Green Setting (Gmax), s			6.0	66.0	56.0
Max Q Clear Time (g_c+I1), s			8.0	22.9	58.0
Green Ext Time (p_c), s			0.0	27.2	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	31.3
HCM 2010 LOS	C

Notes

Intersection	
Intersection Delay, s/veh	4.2
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	425	307	61	10
Demand Flow Rate, veh/h	434	313	62	10
Vehicles Circulating, veh/h	15	21	398	321
Vehicles Exiting, veh/h	316	439	51	13
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.3	3.9	4.2	3.6
Approach LOS	A	A	A	A

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	TR	LT	TR	LT	R	L	LTR
Assumed Moves	LT	TR	LT	TR	LT	R	L	LTR
RT Channelized								
Lane Util	0.470	0.530	0.470	0.530	0.242	0.758	0.500	0.500
Critical Headway, s	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Entry Flow, veh/h	204	230	147	166	15	47	5	5
Cap Entry Lane, veh/h	1272	1272	1266	1266	965	965	1020	1020
Entry HV Adj Factor	0.980	0.980	0.982	0.981	0.999	0.979	1.058	0.938
Flow Entry, veh/h	200	225	144	163	15	46	5	5
Cap Entry, veh/h	1247	1247	1244	1242	963	944	1079	957
V/C Ratio	0.160	0.181	0.116	0.131	0.016	0.049	0.005	0.005
Control Delay, s/veh	4.2	4.4	3.9	4.0	3.9	4.3	3.4	3.8
LOS	A	A	A	A	A	A	A	A
95th %tile Queue, veh	1	1	0	0	0	0	0	0

Intersection	
Intersection Delay, s/veh	10.7
Intersection LOS	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	88	29	63	254	236	88
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	92	30	66	265	246	92
Number of Lanes	1	0	1	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	2
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	2	0	1
HCM Control Delay	9.7	10.6	11.1
HCM LOS	A	B	B

Lane	NBLn1	NBLn2	EBLn1	SBLn1
Vol Left, %	100%	0%	75%	0%
Vol Thru, %	0%	100%	0%	73%
Vol Right, %	0%	0%	25%	27%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	63	254	117	324
LT Vol	0	254	0	236
Through Vol	0	0	29	88
RT Vol	63	0	88	0
Lane Flow Rate	66	265	122	338
Geometry Grp	7	7	2	5
Degree of Util (X)	0.103	0.378	0.184	0.43
Departure Headway (Hd)	5.641	5.138	5.431	4.588
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	633	699	657	783
Service Time	3.392	2.888	3.498	2.635
HCM Lane V/C Ratio	0.104	0.379	0.186	0.432
HCM Control Delay	9	11	9.7	11.1
HCM Lane LOS	A	B	A	B
HCM 95th-tile Q	0.3	1.8	0.7	2.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	958	574	148	448	569	311
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	186.3
Lanes	2	1	1	1	1	1
Cap, veh/h	1090	501	177	1025	714	607
Arrive On Green	0.32	0.32	0.10	0.55	0.38	0.38
Sat Flow, veh/h	3442	1583	1774	1863	1863	1583
Grp Volume(v), veh/h	1008	604	156	472	599	327
Grp Sat Flow(s),veh/h/ln	1721	1583	1774	1863	1863	1583
Q Serve(g_s), s	17.0	19.0	5.2	9.2	17.5	9.6
Cycle Q Clear(g_c), s	17.0	19.0	5.2	9.2	17.5	9.6
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	1090	501	177	1025	714	607
V/C Ratio(X)	0.92	1.20	0.88	0.46	0.84	0.54
Avail Cap(c_a), veh/h	1090	501	177	1025	714	607
HCM Platoon Ratio	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	1.00
Uniform Delay (d), s/veh	19.8	20.5	26.6	8.1	16.8	14.4
Incr Delay (d2), s/veh	13.0	109.8	36.0	1.5	11.3	3.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (95%), veh/ln	13.5	42.6	6.9	5.7	13.4	6.3
Lane Grp Delay (d), s/veh	32.8	130.3	62.7	9.6	28.2	17.8
Lane Grp LOS	C	F	E	A	C	B
Approach Vol, veh/h	1612			628	926	
Approach Delay, s/veh	69.3			22.8	24.5	
Approach LOS	E			C	C	

Timer			
Assigned Phs	5	2	6
Phs Duration (G+Y+Rc), s	10.0	37.0	27.0
Change Period (Y+Rc), s	4.0	4.0	4.0
Max Green Setting (Gmax), s	6.0	33.0	23.0
Max Q Clear Time (g_c+I1), s	7.2	11.2	19.5
Green Ext Time (p_c), s	0.0	7.4	2.2

Intersection Summary	
HCM 2010 Ctrl Delay	47.0
HCM 2010 LOS	D

Notes

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1182	478	256	567
Demand Flow Rate, veh/h	1205	487	261	579
Vehicles Circulating, veh/h	505	153	1520	530
Vehicles Exiting, veh/h	604	1628	190	110
Follow-Up Headway, s	2.800	2.800	2.800	2.800
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	15.8	5.1	15.0	7.9
Approach LOS	C	A	B	A

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	TR	LT	TR	LT	R	L	LTR
Assumed Moves	LT	TR	LT	TR	LT	R	L	LTR
RT Channelized								
Lane Util	0.470	0.530	0.470	0.530	0.318	0.682	0.530	0.470
Critical Headway, s	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Entry Flow, veh/h	566	639	229	258	83	178	307	272
Cap Entry Lane, veh/h	893	893	1151	1151	429	429	877	877
Entry HV Adj Factor	0.982	0.980	0.981	0.982	0.980	0.983	0.979	0.980
Flow Entry, veh/h	556	627	225	253	81	175	301	266
Cap Entry, veh/h	876	875	1129	1130	420	422	858	859
V/C Ratio	0.634	0.716	0.199	0.224	0.194	0.415	0.350	0.310
Control Delay, s/veh	14.1	17.3	5.0	5.2	11.6	16.5	8.2	7.6
LOS	B	C	A	A	B	C	A	A
95th %tile Queue, veh	5	6	1	1	1	2	2	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	471	131	194	635	451	87
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	186.3	186.3	186.3	186.3	190.0
Lanes	1	1	1	1	1	0
Cap, veh/h	591	528	276	1076	573	111
Arrive On Green	0.33	0.33	0.16	0.58	0.38	0.38
Sat Flow, veh/h	1774	1583	1774	1863	1517	294
Grp Volume(v), veh/h	496	138	204	668	0	567
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1863	0	1811
Q Serve(g_s), s	23.3	5.7	9.9	21.2	0.0	25.5
Cycle Q Clear(g_c), s	23.3	5.7	9.9	21.2	0.0	25.5
Prop In Lane	1.00	1.00	1.00			0.16
Lane Grp Cap(c), veh/h	591	528	276	1076	0	684
V/C Ratio(X)	0.84	0.26	0.74	0.62	0.00	0.83
Avail Cap(c_a), veh/h	591	528	276	1076	0	684
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.8	21.9	36.3	12.5	0.0	25.4
Incr Delay (d2), s/veh	13.4	1.2	16.2	2.7	0.0	11.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (95%), veh/ln	18.0	9.9	9.5	14.8	0.0	19.3
Lane Grp Delay (d), s/veh	41.1	23.1	52.5	15.2	0.0	36.5
Lane Grp LOS	D	C	D	B		D
Approach Vol, veh/h	634			872	567	
Approach Delay, s/veh	37.2			23.9	36.5	
Approach LOS	D			C	D	

Timer			
Assigned Phs	5	2	6
Phs Duration (G+Y+Rc), s	18.0	56.0	38.0
Change Period (Y+Rc), s	4.0	4.0	4.0
Max Green Setting (Gmax), s	14.0	52.0	34.0
Max Q Clear Time (g_c+I1), s	11.9	23.2	27.5
Green Ext Time (p_c), s	0.1	10.2	4.1

Intersection Summary	
HCM 2010 Ctrl Delay	31.4
HCM 2010 LOS	C

Notes