


# NORTH TAHOE TRAIL TRANSPORTATION IMPACT ANALYSIS

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*Prepared by LSC Transportation Consultants, Inc*

# *North Tahoe Trail*

# *Transportation Impact Analysis*

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# Chapter 1: Introduction

This document provides an analysis of the transportation-related impacts associated with the proposed North Tahoe Trail segment extending from the North Tahoe Regional Park in Tahoe Vista, California to Carnelian Bay Avenue in Carnelian Bay, California. A review of existing pertinent conditions is first presented. Next, forecasts of trail use levels are presented. Based on these trial use forecasts, the transportation impacts are assessed, including the vehicle-trips associated with trail users, the parking demand generated by those persons driving to the trail, the circulation impacts and the impact on vehicle-miles of travel.

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# Chapter 2: Existing Conditions

## INTRODUCTION

This chapter presents a summary of existing bicycle/pedestrian facilities in the study area, existing bicycle/pedestrian activity and existing traffic conditions

## EXISTING BICYCLE AND PEDESTRIAN FACILITIES

State Route 28 provides a Class II bike lane (striped paved shoulder) between Tahoe City and Crystal Bay. Class I bicycle facilities consist of the Pinedrop Trail (connecting the North Tahoe Regional Park with Pinedrop Lane 1.2 miles to the east), the National Avenue trail along National Avenue from SR 28 to Donner Road, and the Dollar Creek Trail/North Tahoe Trail providing a separated multipurpose path from Tahoe City to Fulton Crescent Drive. There is currently a gap of 3.8 miles (as the crow flies) between existing Class I facilities across the Placer County portion of the North Shore.

Beyond the multipurpose Class I trails, pedestrian facilities in the area are limited to sidewalks in the Carnelian Bay, Kings Beach and Tahoe City core areas, and some limited sidewalks in the Kings Beach residential areas. Outside of these areas, pedestrians are forced to walk along the roadway shoulders.

## EXISTING BICYCLE AND PEDESTRIAN ACTIVITY

Bicycling and walking are popular activities in the Lake Tahoe North Shore region. The Tahoe Regional Planning Agency's *2016 Data Collection Report – Lake Tahoe Regional Bicycle and Pedestrian Monitoring Program* indicated 212 total cyclists and pedestrians per hour along SR 28 in Kings Beach during a peak summer count period (the highest volume of any location surveyed around the Tahoe Basin), while the Tahoe City Public Utility District reported over 60,000 users of their Class I trail system in July of 2016.

### Trail Counts

The Tahoe Regional Planning Agency (TRPA) maintains a region-wide network of automated trail count equipment, which provides useful information regarding use patterns on nearby trails.

#### Dollar Creek Trail

Monthly user count data from May 2019 to April 2020 on the Dollar Creek Trail just north of SR 28 is shown in Table 1 and Figure 1. Over this year, a total of 72,544 trips past the count location were recorded.[1] Overall trail use is greatest during the month of July, with 11,886 users (a daily average of 383). In the peak summer, 66 percent of users are pedestrians and 34 percent cyclists. While winter cycling activity falls to negligible levels, pedestrian activity still ranges from 91 to 128 daily average users.

Figure 2 presents a day-to-day graph of trail use on both the Dollar Creek Trail and Pinedrop Trail over the busy summer period. On both trails, it reflects the wide variation of use levels and the particularly high level of use over the 4th of July period.

Hourly use patterns for two busy summer days are shown in Table 2. Total trail activity was observed to peak in the late afternoon on Friday and in the morning on Saturday.

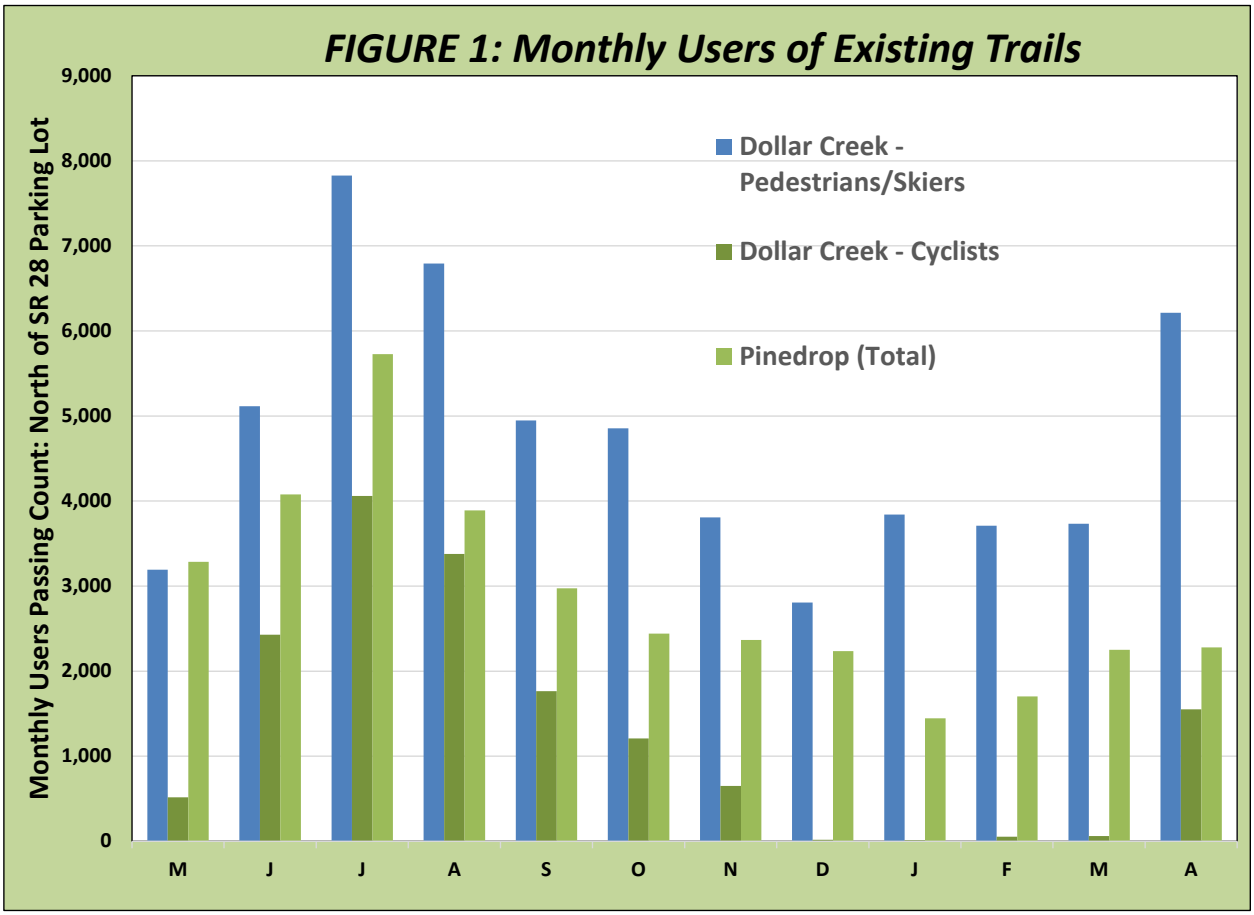
[1] Note that trail users making an out-and-back trip past the counter are recorded as two uses.

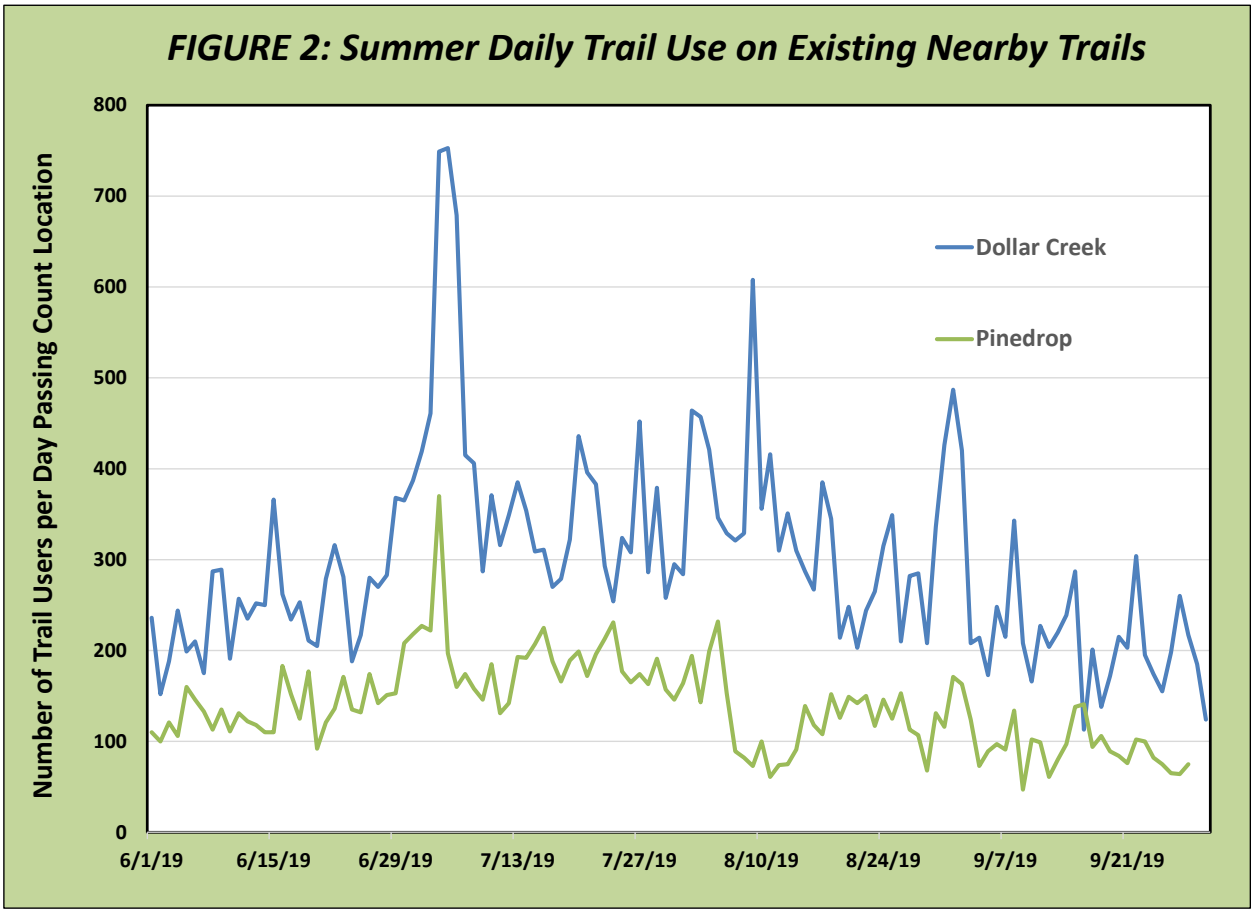
## TABLE 1: Dollar Creek Trail Monthly Trail Use

| | Total Monthly Trail Users | | | Percent by Type | | Average Daily | | | Maximum Daily | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month | Peds | Cyclists | Total | Peds | Cyclists | Peds | Cyclists | Total | Peds | Cyclists | Total |
| May-19 | 3,193 | 517 | 3,710 | 86% | 14% | 103 | 17 | 120 | 208 | 52 | 241 |
| Jun-19 | 5,114 | 2,429 | 7,543 | 68% | 32% | 170 | 81 | 251 | 255 | 146 | 368 |
| Jul-19 | 7,826 | 4,060 | 11,886 | 66% | 34% | 252 | 131 | 383 | 523 | 264 | 753 |
| Aug-19 | 6,793 | 3,378 | 10,171 | 67% | 33% | 219 | 109 | 328 | 422 | 186 | 608 |
| Sep-19 | 4,948 | 1,765 | 6,713 | 74% | 26% | 165 | 59 | 224 | 366 | 178 | 487 |
| Oct-19 | 4,856 | 1,209 | 6,065 | 80% | 20% | 157 | 39 | 196 | 289 | 94 | 334 |
| Nov-19 | 3,808 | 650 | 4,458 | 85% | 15% | 127 | 22 | 149 | 197 | 64 | 232 |
| Dec-19 | 2,808 | 18 | 2,826 | 99% | 1% | 91 | 1 | 91 | 362 | 6 | 363 |
| Jan-20 | 3,840 | 12 | 3,852 | 100% | 0% | 124 | 0 | 124 | 369 | 3 | 372 |
| Feb-20 | 3,709 | 53 | 3,762 | 99% | 1% | 128 | 2 | 130 | 289 | 8 | 295 |
| Mar-20 | 3,732 | 61 | 3,793 | 98% | 2% | 120 | 2 | 122 | 240 | 10 | 245 |
| Apr-20 | 6,214 | 1,551 | 7,765 | 80% | 20% | 207 | 52 | 259 | 338 | 131 | 450 |
| **Total** | **56,841** | **15,703** | **72,544** | **78%** | **22%** | **155** | **43** | **198** | **523** | **264** | **753** |

Source: TRPA Trail Counts 2019-2020

## *FIGURE 1: Monthly Users of Existing Trails*






## Pinedrop Trail

Monthly activity on the Pinedrop Trail is shown in Table 3. Trail use is highest in July (5,728, or an average of 185 per day) and lowest in February (1,704, or 59 per day on average). Over the course of the year, use totals 34,679. Due to limitations on the counter, separate figures for pedestrians vs. bicyclists are not available at this location.

Hourly use patterns are shown in Table 4. In comparison with the Dollar Creek Trail, use is spread a bit more evenly over the day and extends farther into the evening.

# EXISTING TRAFFIC CONDITIONS

Traffic volumes on SR 28 between Carnelian Bay and Tahoe Vista are presented in Table 5, based upon Caltrans counts. As shown, the annual average daily two-way traffic volume on SR 28 in the most recent year available (2018) was 9,100 between Carnelian Bay Road and Granite Road, and 10,600 between Granite Road and National Avenue. During the peak month (July) the volumes are 12,600 and 13,600, respectively. As also shown in Table 5, traffic volumes have fallen over the last ten years – around 15 percent on an annual basis and around 28 percent in the peak month.

Placer County conducted traffic counts on National Avenue just north of SR 28 on Tuesday, September 1, 2017. This count indicated a total daily volume of 2,479, with an AM peak hour volume of 186 and a PM peak hour volume of 250. No counts are available for other county roadways in the site vicinity.

## TABLE 2: Hourly User Counts: Dollar Creek Trail North of SR 28 Trailhead

| Hour Beginning | Friday July 17, 2020 | | | | Saturday July 18, 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| | Pedes-trians | Bicycl-ists | Total | % of Peak | Pedes-trians | Bicycl-ists | Total | % of Peak |
| 12:00 AM | 2 | 2 | 4 | 4% | 0 | 0 | 0 | 0% |
| 1:00 AM | 0 | 0 | 0 | 0% | 1 | 0 | 1 | 1% |
| 2:00 AM | 0 | 0 | 0 | 0% | 0 | 0 | 0 | 0% |
| 3:00 AM | 0 | 0 | 0 | 0% | 0 | 0 | 0 | 0% |
| 4:00 AM | 0 | 0 | 0 | 0% | 0 | 0 | 0 | 0% |
| 5:00 AM | 1 | 0 | 1 | 1% | 0 | 0 | 0 | 0% |
| 6:00 AM | 3 | 0 | 3 | 3% | 4 | 0 | 4 | 3% |
| 7:00 AM | 22 | 5 | 27 | 26% | 24 | 5 | 29 | 22% |
| 8:00 AM | 42 | 9 | 51 | 50% | 66 | 20 | 86 | 66% |
| 9:00 AM | 38 | 37 | 75 | 74% | 90 | 41 | 131 | 100% |
| 10:00 AM | 40 | 33 | 73 | 72% | 62 | 29 | 91 | 69% |
| 11:00 AM | 26 | 27 | 53 | 52% | 37 | 33 | 70 | 53% |
| 12:00 PM | 30 | 12 | 42 | 41% | 27 | 48 | 75 | 57% |
| 1:00 PM | 7 | 21 | 28 | 27% | 38 | 23 | 61 | 47% |
| 2:00 PM | 25 | 25 | 50 | 49% | 21 | 39 | 60 | 46% |
| 3:00 PM | 17 | 18 | 35 | 34% | 46 | 13 | 59 | 45% |
| 4:00 PM | 59 | 10 | 69 | 68% | 17 | 16 | 33 | 25% |
| 5:00 PM | 93 | 9 | 102 | 100% | 56 | 4 | 60 | 46% |
| 6:00 PM | 37 | 13 | 50 | 49% | 44 | 6 | 50 | 38% |
| 7:00 PM | 16 | 8 | 24 | 24% | 15 | 2 | 17 | 13% |
| 8:00 PM | 9 | 4 | 13 | 13% | 10 | 9 | 19 | 15% |
| 9:00 PM | 3 | 0 | 3 | 3% | 1 | 1 | 2 | 2% |
| 10:00 PM | 3 | 0 | 3 | 3% | 0 | 0 | 0 | 0% |
| 11:00 PM | 0 | 0 | 0 | 0% | 2 | 0 | 2 | 2% |
| **Total Daily** | **473** | **233** | **706** | | **561** | **289** | **850** | |
| **% by User Type** | **67.0%** | **33.0%** | | | **66.0%** | **34.0%** | | |
| **Peak Hour Percentage** | **19.7%** | **15.9%** | **14.4%** | | **16.0%** | **16.6%** | **15.4%** | |

Source: TRPA automated trail count program.

**TABLE 3: Pinedrop Trail Monthly Use**

| Month Beginning | Monthly Total | Average Daily | Maximum Daily |
|---|---|---|---|
| 1/1/2020 | 1,445 | 47 | 89 |
| 2/1/2020 | 1,704 | 59 | 109 |
| 3/1/2018 | 2,251 | 73 | 171 |
| 4/1/2018 | 2,279 | 74 | 107 |
| 5/1/2018 | 3,285 | 110 | 239 |
| 6/1/2018 | 4,078 | 136 | 208 |
| 7/1/2018 | 5,728 | 185 | 370 |
| 8/1/2018 | 3,890 | 125 | 232 |
| 9/1/2018 | 2,975 | 99 | 172 |
| 10/1/2018 | 2,441 | 79 | 140 |
| 11/1/2018 | 2,366 | 76 | 158 |
| 12/1/2017 | 2,237 | 72 | 153 |
| TOTAL | 34,679 | | |

Source: TRPA counts. Due to equipment failures, data for 12 continuous months not available. The most recent available data for each month is reported.

As reported in the *Environmental Impact Report/Environmental Impact Statement: Placer County Tahoe Basin Area Plan and Tahoe City Lodge Project* (Ascent Environmental, Inc., June 2016), the Level Of Service (LOS) along SR 28 between Dollar Hill and Tahoe Vista is a relatively good LOS C.[2] The *Tahoe Basin Area Plan* also indicates an existing LOS of A at the SR 28/National Avenue intersection. In general, while there are poor traffic conditions both to the east (in Kings Beach) and to the west (in Tahoe City) the segment of SR 28 between Carnelian Bay and Tahoe Vista provides generally good traffic conditions.

## EXISTING ACTIVITY AT CARNELIAN BAY AVENUE/TRIPOLI DRIVE

While the eastern end of the proposed trail is in the North Tahoe Regional Park with a high level of existing activity, the western end along Carnelian Bay Avenue (Forest Road 16N63) is near an existing residential neighborhood with relatively little activity. To provide a basis for assessing impacts in this neighborhood, a survey was conducted of bicycle, pedestrian and vehicle activity for each of the three legs of the Carnelian Bay Avenue/Tripoli Drive intersection over four hours of a summer Saturday (August 1, 2020). As shown in Table 6, movements (by mode) were recorded by direction on each leg by 15 minute period.[3] Overall activity was observed to be low, averaging 3 pedestrians, 3 cyclists and 3 motor vehicles per hour.

[2] LOS is a scale used to measure traffic conditions, ranging from LOS A (no congestion) to LOS F (long delays with stop-and-go traffic conditions). The Tahoe Basin Area Plan as well as TRPA define LOS D to be the standard.

[3] This count method results in a single individual resulting in two counts. A pedestrian walking south on Carnelian Bay Avenue and turning west on Tripoli Road would be recorded as a single movement on both the southbound Carnelian Bay Avenue leg and the westbound Tripoli Road west leg.

## TABLE 4: Hourly Trail User Counts -- Pinedrop Trail
## Average of All Days in July 2020

| | All Days | | Weekends | | Weekdays | |
|---|---|---|---|---|---|---|
| **Hour** | # | % of Peak | # | % of Peak | # | % of Peak |
| 00:00 | 0.0 | 0% | 0.0 | 0% | 0.0 | 0% |
| 01:00 | 0.0 | 0% | 0.0 | 0% | 0.0 | 0% |
| 02:00 | 0.0 | 0% | 0.0 | 0% | 0.0 | 0% |
| 03:00 | 0.0 | 0% | 0.0 | 0% | 0.0 | 0% |
| 04:00 | 0.0 | 0% | 0.0 | 0% | 0.0 | 0% |
| 05:00 | 0.2 | 1% | 0.1 | 0% | 0.2 | 1% |
| 06:00 | 3.0 | 13% | 2.8 | 8% | 3.1 | 14% |
| 07:00 | 9.1 | 38% | 6.1 | 18% | 10.2 | 48% |
| 08:00 | 14.0 | 59% | 12.8 | 38% | 14.5 | 68% |
| 09:00 | 23.8 | 100% | 30.0 | 89% | 21.4 | 100% |
| 10:00 | 23.5 | 99% | 33.7 | 100% | 19.4 | 91% |
| 11:00 | 18.3 | 77% | 23.0 | 68% | 16.4 | 77% |
| 12:00 | 15.4 | 65% | 16.5 | 49% | 15.0 | 70% |
| 13:00 | 12.5 | 53% | 17.6 | 52% | 10.5 | 49% |
| 14:00 | 10.5 | 44% | 14.2 | 42% | 9.0 | 42% |
| 15:00 | 9.1 | 38% | 8.5 | 25% | 9.4 | 44% |
| 16:00 | 11.6 | 49% | 10.8 | 32% | 11.9 | 56% |
| 17:00 | 13.2 | 55% | 13.6 | 41% | 13.0 | 61% |
| 18:00 | 16.1 | 67% | 12.8 | 38% | 17.4 | 81% |
| 19:00 | 14.9 | 63% | 13.5 | 40% | 15.5 | 72% |
| 20:00 | 5.4 | 22% | 4.4 | 13% | 5.7 | 27% |
| 21:00 | 0.3 | 1% | 0.0 | 0% | 0.5 | 2% |
| 22:00 | 0.0 | 0% | 0.0 | 0% | 0.0 | 0% |
| 23:00 | 0.0 | 0% | 0.0 | 0% | 0.0 | 0% |
| | 201.0 | | 220.6 | | 193.0 | |
| **Peak Hour Percentage** | **11.9%** | | **15.3%** | | **11.1%** | |

Source: TRPA automated trail count program.

## TABLE 5: Summary of Caltrans SR 28 Traffic Counts

| | | | | | | | | 10-Year Change | |
|---|---|---|---|---|---|---|---|---|---|
| Between | And | 2008 | 2010 | 2012 | 2014 | 2016 | 2018 | # | % |
| **Average Daily Traffic Volume in Peak Month (July)** | | | | | | | | | |
| Carnelian Bay Road | Granite Road | 17,400 | 17,400 | 17,400 | 17,400 | 11,900 | 12,600 | -4,800 | -28% |
| Granite Road | National Avenue | 18,900 | 18,900 | 18,900 | 18,900 | 14,800 | 13,600 | -5,300 | -28% |
| **Average Annual Daily Traffic Volume** | | | | | | | | | |
| Carnelian Bay Road | Granite Road | 11,000 | 11,000 | 11,000 | 11,000 | 8,500 | 9,100 | -1,900 | -17% |
| Granite Road | National Avenue | 12,000 | 12,000 | 12,000 | 12,000 | 10,500 | 10,600 | -1,400 | -12% |

Source: https://dot.ca.gov/programs/traffic-operations/census. Most recent data as of 11/11/20.

## TABLE 6: Observed Activity at Carnelian Bay Boulevard/Tripoli Drive

*Saturday, August 1, 2020*

| | | Cars/Vehicles | | | | | | Bikes | | | | | | Pedestrians | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Tripoli W. of CB Ave | | Tripoli E. of CB Ave | | Carnelian Bay Ave | | Tripoli W. of CB Ave | | Tripoli E. of CB Ave | | Carnelian Bay Ave | | Tripoli W. of CB Ave | | Tripoli E. of CB Ave | | Carnelian Bay Ave | |
| Time | | EB | WB | EB | WB | NB | SB | EB | WB | EB | WB | NB | SB | EB | WB | EB | WB | NB | SB |
| 12:00 PM | 12:15 PM | | | | | | | | | | | | | | | | | | |
| 12:15 PM | 12:30 PM | | 2 | | 3 | 1 | | | | | | | | | 2 | | | | 2 |
| 12:30 PM | 12:45 PM | | | | | | | | 2 | | 3 | 1 | | | | | | | |
| 12:45 PM | 1:00 PM | 2 | | 2 | | | | | | | | | | | | | | | |
| 1:00 PM | 1:15 PM | 1 | 1 | 1 | 1 | | | | | 1 | | | 1 | | | | | | |
| 1:15 PM | 1:30 PM | 1 | | 1 | | | | | | | | | | | | | | | |
| 1:30 PM | 1:45 PM | 1 | | 1 | | | | | | | | | | | | | | | |
| 1:45 PM | 2:00 PM | | | | | | | 2 | 1 | 2 | 1 | | | | 2 | | | | 2 |
| 2:00 PM | 2:15 PM | | | | | | | | | | | | | | | | | | |
| 2:15 PM | 2:30 PM | | 1 | 1 | 1 | | 1 | | | | | | | | 1 | | 1 | | |
| 2:30 PM | 2:45 PM | | | | | | | 1 | | | | 1 | | | | | | | |
| 2:45 PM | 3:00 PM | | 1 | | 1 | | | 1 | | 2 | | | 1 | | | | | | |
| 3:00 PM | 3:15 PM | 1 | | 1 | 1 | 1 | | 1 | | | | 1 | | | | | | | |
| 3:15 PM | 3:30 PM | | 1 | 2 | | 1 | 2 | | | | | | | | | | | | |
| 3:30 PM | 3:45 PM | | 1 | | | | 1 | 1 | | 1 | | | | | | | | | |
| 3:45 PM | 4:00 PM | 1 | 1 | 1 | 2 | 1 | | | | | | | | | 3 | | 3 | | |
| **Average Hourly** | | **1.75** | **2** | **2.5** | **2.25** | **1** | **1** | **1.5** | **0.75** | **1.5** | **1** | **0.75** | **0.5** | **0** | **2** | **0** | **1** | **0** | **1** |

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A key issue in the evaluation of the project is the level of bicycle and pedestrian activity that would use the facility. As part of the study team, LSC Transportation Consultants, Inc. applied the Tahoe Region Bicycle and Pedestrian Corridor Use Model, most recently updated for the Tahoe Regional Planning Agency in 2018, to estimate the user demand for the proposed Dollar Creek Trail. This model was developed based upon observed bicycle and pedestrian activity on existing Class I facilities in the Tahoe Region, as well as input from trail use planners.[4]

This analysis estimates the number of trail users in the following categories:

- Residents biking to the trail from home
- Visitors biking to the trail from lodging
- Residents or visitors driving to the trail to bicycle
- Residents walking to the trail from home
- Visitors walking to the trail from lodging
- Residents or visitors driving to the trail to walk.

Use levels are developed for these individual categories in order to reflect the differing levels of use between residents and visitors, as well as the differing factors affecting use by those trail users driving to trailheads in the region versus those walking or biking from their home or lodging.

Note that this analysis focuses specifically on the current proposed phase of the North Tahoe Trail, from Carnelian Bay to the North Tahoe Regional Park. Extension of this trail further west to complete the trail to Dollar Hill and Tahoe City would generate additional use and change access patterns.

Trail usage estimations are provided for the following three time periods: daily, peak hour, and annual. This methodology was developed in 2009 as part of the Tahoe Regional Planning Agency's (TRPA's) 2010 Lake Tahoe Region Bicycle and Pedestrian Plan and is calibrated against observed trail use levels in the Tahoe Region. It first identifies the "maximum feasible demand" —the level of use that would be expected if all characteristics of the facility and its setting were optimal. A series of factors are then applied that reflect characteristics that are less than optimal, to result in estimates of actual, realizable use levels.

## MAXIMUM FEASIBLE DEMAND

Estimation of the maximum feasible demand is the starting point for estimation of the usage of the trail. Maximum feasible demand is estimated separately for each category of users listed above. The estimation of the maximum feasible demand is based on the TRPA TransCAD regional travel demand model. This regionwide model disaggregates the Tahoe Region into a total of 187 "Traffic Analysis Zones" (TAZs), including a total of 7 along the proposed trail. The *Tahoe Region Bicycle and Pedestrian Corridor Use Model*

[4] A full discussion of the use model is provided in the *Tahoe Regional Bicycle and Pedestrian Use Model* memo, LSC, July 30, 2018.

applies the data from the travel demand model to the specific areas which the proposed multi-use trail would serve.

### Bicycle Demand

The TRPA Bicycle Use Model is based upon observed trail usage and trail user characteristics in the Tahoe Basin. For user trips directly from a cyclist's home or lodging, the bicycle use model considers all trips with an origin or destination in all TAZs within one half mile of the trail. Based on the TRPA regional TransCAD travel demand model, there are 604 daily resident trips on all modes in the corridor of which 7.5 percent have the potential to be bicycle trips using the trail, and 4,684 daily visitor trips on all modes of which 5.5 percent have the potential to be bicycle trips using the trail.

### Pedestrian Demand

The TRPA Pedestrian Use Model considers the total resident and visitor populations in the corridor area (excluding those pedestrians driving to the facility, as discussed below). The methodology for the Use Model reflects that the maximum feasible daily pedestrian usage of a trail in the Tahoe area is equivalent to 3.5 percent of the population in the corridor in which the trail is located. The resident and visitor populations in the proposed trail corridor are 1,549 and 781, respectively. Therefore, the maximum feasible daily usage estimates for pedestrians walking to the trail as estimated by the model are 50 daily person-trips generated by residents and 20 daily person-trips generated by visitors.

### Drive-to-Trail Demand

Demand for trail users driving to the trail is estimated separately from trail users accessing the trail directly by bicycle/pedestrian modes. The estimation procedure is based on trail surveys conducted at existing Class I multiuse trails in the Lake Tahoe area. The maximum feasible daily demand for bicyclists driving to the trail is 480 bicycle trips and the maximum feasible daily demand for pedestrians driving to the trail is 125 walking trips.

## REDUCTION FACTORS

Once a maximum feasible usage is estimated, it is necessary to adjust the figure based on the specific alignment and characteristics of the trail. Reduction factors are applied to the maximum feasible demand estimate to adjust it for decreases in potential trail use based on the following factors: class, grade, continuity, maintenance, recreational value, and congestion. The reduction factors for each category are estimated and applied separately for bicyclists and pedestrians and separately for each type of trail user, as listed in the first paragraph of this memo (resident, visitor, and drive-to-trail users).

### Class

A usage reduction is applied for the class of the proposed new bicycle or pedestrian facility (I, II, or III). The North Tahoe Trail is proposed to be constructed to at least Class I standards (separated facility) for its entirety. Therefore, no reduction in trail usage is assumed for trail classification.

### Grade

Reductions are taken from the initial use estimates for the trail based on grades and elevation changes experienced by trail users. No reduction is taken for mostly flat trails with short segments of grades of less than 4 percent. Moderate reductions (10 to 30 percent) are taken for trails with moderate grade sections (between 4 and 8 percent). Greater reductions (20 to 65 percent) are taken for trails with steep grades and large elevation changes (greater than 300 feet).

The proposed alignment for the proposed trail traverses some substantial steep terrain and elevation changes over the course of its alignment. The elevation of the trail increases by approximately 380 feet traveling from the Regional Park to the highest point, and then descents by 186 feet to Carnelian Bay Avenue. The section of the trail immediately west of the highest point (from 2,000 feet to 3,600 feet east of Carnelian Bay Avenue) climbs 145 feet, for an average grade of 8.3 percent. There are other segments where grades, by the preliminary plans, will equal or exceed 8 percent. For these reasons, it is reasonable to assume a reduction in trail usage for the grade category based on the "high" criteria. The grade reduction factors consider that bicyclists as a group are more sensitive to grades than pedestrians. Additionally, visitors and drive-to-trail users are more sensitive to grades than residents biking and walking to the trail. The reduction factors assumed for grades on the proposed trail are shown in the middle columns of Table 7.

## Continuity

"Breaks" in trail continuity tend to reduce the attractiveness of a facility to users. There are no proposed roadway crossings along this proposed trail segment. While this trail segment is relatively short, it has continuity with the Pinedrop Trail to the east and to use trails to the west.

## Maintenance

Poor trail surfaces can also reduce use, such as presence of sand, pavement condition, and debris that regularly occur on the trail. As a new facility, it is assumed that the pavement will be in excellent condition and that the trail will be properly maintained. Therefore, no reduction in trail usage for maintenance issues is applied for the North Tahoe Trail.

## Recreational Value

A reduction factor is applied to the trail usage estimates based on the recreational and scenic value of the trail. Trails located along an especially scenic corridor such as lakefront or river front are considered to have the highest recreational value and no reduction factor is applied for these trails. Trails through urbanized areas are considered to have a low recreational value and are subject to a 15 to 75 percent reduction in usage estimates varying by user type, with users driving to the trail subject to the greatest reduction.

The proposed alignment for the trail passes through an attractive undeveloped wooded area and across open slopes. The forest through this area has recently been thinned for forest management and fire safety, providing a variety of open and dense woods through the trail corridor. The trail alignment would also access viewpoints with dramatic views down the length of Lake Tahoe. These characteristics place the trail into the "high" recreational value category.

## Congestion

A final reduction factor is applied to the trail usage estimates based on the trail congestion. Trail congestion is estimated based on the "Shared Off-street Path" level of service methodology in the *Highway Capacity Manual* (Transportation Research Board, 2010). Level of service is based on the number of passing events that occur during the peak hour of trail use. A passing event is defined as either passing a bicycle/pedestrian traveling in the opposite direction or overtaking another bicycle/pedestrian traveling in the same direction. Considering the expected use levels, no significant congestion is expected along the North Tahoe Trail. However, with an estimated 59 one-way trail trips in the peak hour, it is assumed that trail users will

## TABLE 7: Tahoe Region Bicycle and Pedestrian Corridor Use Model Analysis of North Tahoe Trail Phase 2

*At Location of Peak Demand in Corridor*

| | |
|---|---|
| Location | North Tahoe Trail -- Regional Park to Carnelian Bay |
| Scenario | Individual Phase -- Not Continuing to the West |
| Analyst | GRS |

| Corridor | Maximum Feasible Demand | Use Factor -- Reduction from Maximum | | | | | | | Daily Use Estimate | Peak Hour Factor (1) | Peak Hour Use Estimate | Annual / Daily Factor (1) | Annual Use Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Class | Grade | Continuity | Maint-enance | Recre-ational Value | Conges-tion | Multi-plicative Total | | | | | |
| **BICYCLISTS** | | | | | | | | | | | | | |
| Resident Bike to Facility | 50 | 0.00 | 0.40 | 0.00 | 0.00 | 0.00 | 0.13 | 0.48 | 26 | | | | |
| Visitor Bike to Facility | 260 | 0.00 | 0.60 | 0.00 | 0.00 | 0.00 | 0.06 | 0.63 | 97 | | | | |
| Bicyclists Drive to Facility | 480 | 0.00 | 0.65 | 0.00 | 0.00 | 0.00 | 0.04 | 0.66 | 161 | | | | |
| Total -- Best Estimate | | | | | | | | | 284 | 0.154 | 44 | 60 | 17,000 |
| *High End of Estimate Range* | | | | | | | | | *355* | | *55* | | *21,250* |
| *Low End of Estimate Range* | | | | | | | | | *213* | | *33* | | *12,750* |
| **PEDESTRIANS** | | | | | | | | | | | | | |
| Resident Walk to Facility | 50 | -- | 0.20 | 0.00 | 0.00 | 0.00 | 0.10 | 0.28 | 36 | | | | |
| Visitor Walk to Facility | 20 | -- | 0.36 | 0.00 | 0.00 | 0.00 | 0.05 | 0.39 | 12 | | | | |
| Pedestrians Drive to Facility | 125 | -- | 0.37 | 0.00 | 0.00 | 0.00 | 0.05 | 0.40 | 75 | | | | |
| Total -- Best Estimate | | | | | | | | | 123 | 0.169 | 21 | 109 | 13,000 |
| *High End of Estimate Range* | | | | | | | | | *185* | | *31* | | *19,500* |
| *Low End of Estimate Range* | | | | | | | | | *62* | | *10* | | *6,500* |
| **TOTAL -- Best Estimate at Peak Location (North of Regional Park)** | | | | | | | | | **407** | | **65** | | **30,000** |
| ***High End of Estimate Range*** | | | | | | | | | ***540*** | | ***86*** | | ***40,750*** |
| ***Low End of Estimate Range*** | | | | | | | | | ***275*** | | ***43*** | | ***19,250*** |
| **TOTAL Best Estimate for Entire Trail** | | | | | | | | | | | | | |
| | | | | | Bicyclists | | | 15% | **327** | | **50** | | **19,550** |
| | | | | | Pedestrians | | | 20% | **148** | | **25** | | **15,600** |
| | | | | | Total | | | | **474** | | **75** | | **35,150** |

Notes

See the Tahoe Region Bicycle and Pedestrian Use Models, except as noted below.

1. Based on Dollar Hill Trail and Pinedrop Trail counts

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experience a small amount of congestion on the trail. Therefore, a slight reduction in potential usage (based on LOS B or C trail conditions) is assumed for trail congestion. The reduction factors assumed for trail congestion are shown in the middle columns of Table 7.

### Total Reductions

The total reduction applied is a multiplicative total of all the reduction factors. The reductions factors and trail usage estimates are provided in Table 7.

## TRAIL USAGE AT LOCATION OF PEAK DEMAND

The result of applying the reduction factors to the maximum feasible demand is the estimated daily trail usage at the location of peak demand along the trail. The point of the trail with the highest forecast usage for bicycle trips is calculated to be the segment just north of the Regional Park. The demand estimate calculations and results for all user categories are provided in Table 7. As shown, the estimated daily trail use levels at this location are 284 bicyclist trips and 123 pedestrian trips (a total of 407 daily users). Factoring by the proportion of daily use occurring in the peak hour on the existing Dollar Creek and Pinedrop trail segments, the estimated peak hour trail usages at this location are 44 bicyclist trips and 21 pedestrian trips (a total of 65).

## TRAIL USAGE ALONG ENTIRE TRAIL

Some of the trail users will make trips on the trail that do not include use of the peak use trail segment near the Regional Park. Examples would be persons accessing from the north on Regency Way (and the connecting dirt road) traveling to/from Carnelian Bay, or recreational walkers starting from the west end of the trail that turn around before reaching the Regional Park. Based on the relative proportion of users accessing at each of the three access points (as discussed below) and the observed average trip length for cyclists and pedestrians in the Tahoe Region, it is estimated that 10 percent additional cyclists and 15 percent additional pedestrians will use other sections of the trail. Including these additional users, the total trail users over the entire trail in over the course of the day are estimated to consist of 327 cyclists and 148 pedestrians, for a total of 474 users. The peak hour users are estimated to consist of 50 cyclists plus 25 pedestrians, for a total of 75.

TRPA trail counter data was obtained for both the Dollar Creek trail segment and the Pinedrop trail segment, to compare the total annual use to the peak day use levels. This data indicates that the ratio of annual to peak day pedestrians is 109, while the equivalent ratio for cyclists is 60. Applying these factors, total annual trail users are estimated to consist of 19,550 cyclists plus 15,600 pedestrians (including those on cross-country skis or snowshoes), for a total of 35,150 trail users.

## TRAIL ACCESS PATTERNS

The primary access points to the proposed trail would be as follows:

- ➔ On the east, the trail starts in the upper portion of the North Tahoe Regional Park. The Pinedrop Trail provides ongoing Class I access east to Pinedrop Lane and SR 267. South through the park, Donner Road and the National Avenue Trail provide a good connection to SR 28. There is a traffic signal at the National Avenue/SR 28 intersection to facilitate any trail user crossing of the highway.
- ➔ On the west, the trail starts along Carnelian Bay Avenue (Forest Service Road 16N63) at a point 0.36 miles north of (and 180 feet higher in elevation than) Tripoli Road. This road

connects the Agate Bay subdivision to the south with the paved Forest Road 73 (the "Fiberboard Freeway") just to the west of SR 267 at Brockway Summit. A spur (Forest Road 16N93) also provides access to the Regency Way area of northern Tahoe Vista. Carnelian Bay Avenue (Forest Road 16N63) is a single lane road (approximately 10 feet in width). It is paved between Tripoli Road at a point 0.18 miles to the north (at the northernmost house). North of this point, it is a dirt road not maintained for passenger car travel and not plowed in winter. It is currently passable in good weather by a two-wheel-drive vehicle with adequate ground clearance. There is currently a series of informal use trails accessible off of the west end of Tripoli Road, just to the west of the Carnelian Bay Avenue intersection. Some modest drive-to-trail activity is observed at this location, using informal parking at the end of Tripoli Road. In addition, there is an informal unpaved trail ("Short Cut Trail") that connects Agate Road (500 feet from the Carnelian Bay Avenue/Tripoli Road intersection) with the northern end of Carnelian Woods Avenue in Carnelian Bay.

➔ There is also a good opportunity to access the trail to the north, via a 400-foot walk or bike along a gated dirt road heading south from Regency Way 1,300 feet east of Straton Way.

## Recreational Use

Much of the existing use on Class I facilities in the Tahoe Region is generated by recreational users. Based on the observed use patterns and the adjacent land uses, typical recreational use patterns for the new trail are expected to consist of the following:

Cyclists riding the length of the trail, either turning around at the far end, or making a loop with another roadway. An attractive loop route would combine use of the new trail along with Regency Way and Carnelian Bay Avenue. As the length of the trail is less than the reported average cycle trip length in the region, most cyclists are expected to use the full length of the trail.

Pedestrians making an "out-and-back" trip on the trail. As a full round trip on the trail is longer (5.4 miles) than the typical reported recreational round-trip (3 miles), most pedestrians will use only a portion of the trail. A round-trip from one end or the other to the view at the high point of the trail would be popular. This would provide a 1.5-mile round-trip walk from the west end of the trail, a 3.5 mile walk from the east end, or a 1.6 mile walk from Regency Way.

## Non-Recreational Use

Non-recreational use consists of commute trips, shopping trips and other trips to access a specific destination. The new trail will not be an attractive alternative to cycling along SR 28 between Tahoe Vista and Carnelian Bay. Between the SR 28/National Avenue and SR 28/Carnelian Woods Avenue intersection, using the new trail (along with National Avenue, Donner Road, the Short Cut Trail and Carnelian Woods Avenue) is a one-way distance of 4.9 miles and requires a 600-foot climb. In comparison, the highway shoulder (which has designated bike lanes the entire length) is only 2.4 miles in travel distance with 87 feet in total elevation gain. Choosing the trail for commuting along the corridor for a typical non-e-bike cyclist would add at least 20 minutes of travel time.

The eastern end of the new trail will be a benefit for persons making non-recreational trips from the neighborhood on the western end of Regency Way to Tahoe Vista and Kings Beach. While this trip can currently be made using the Pinedrop Trail and existing dirt roads, the new paved trail would reduce the length of unpaved road travel from 2,100 feet to 600 feet and would provide a significantly easier grade.

However, given the limited number of homes in this western portion of Regency Way area and the limited number of persons willing to make a purpose trip that includes a 400- to 500-foot climb, the actual number of additional non-recreational trips will be minimal.

## Overall Access Patterns

The proportion of trail users accessing via the three access points can be evaluated based on the resident and visitor population adjacent to the access points, as well as the convenience of access to the trail. Using the TRPA Traffic Analysis Zone population data, and considering the availability of existing Class I trails to residents of the individual neighborhoods, the following access patterns are expected:

- North Tahoe Regional Park—76 percent
- Carnelian Bay Boulevard—13 percent
- Regency Way—11 percent.

Over the course of a peak day, 360 trail users are expected to access via the Regional Park, 61 via Carnelian Bay Boulevard and 53 via Regency Way.

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# Chapter 4: Impacts Analysis

This chapter presents analysis of the key potential circulation-related impacts of the proposed project, focusing on parking, vehicle-miles of travel, traffic circulation and construction traffic.

## TRAFFIC CIRCULATION IMPACTS

As shown in Table 7, many of the trail users will access by driving to the trailheads. The number of person-trips of the "drive-to" users can be converted to the number of vehicles by dividing by an average auto occupancy. Trail user surveys in the Tahoe Region indicate an average auto occupancy of 2.2 persons per vehicles for cyclists driving to the trails and 1.4 for pedestrians driving to the trails. Dividing the auto access user figures by these occupancy rates and allocating based on the distribution presented above indicates the following vehicle-trips over the course of a peak day:

- North Tahoe Regional Park—113 roundtrips, or 226 one-way trips
- Carnelian Bay Avenue—19 roundtrips, or 38 one-way trips
- Regency Way—17 roundtrips, or 34 one-way trips

During the peak-hour on a peak day, the following vehicle-trips would be generated:

- North Tahoe Regional Park—18 round-trips, or 36 one-way trips
- Carnelian Bay Avenue—3 roundtrips, or 6 one-way trips
- Regency Way—3 roundtrips, or 6 one-way trips

At the North Tahoe Regional Park trailhead, these volumes will add to the existing traffic activity on Donner Road and National Avenue. Given the good existing LOS at the National Avenue/SR 28 intersection (as discussed above), this additional traffic will not significantly impact traffic circulation conditions. At the Carnelian Bay Avenue trailhead, the modest level of additional traffic will disperse over the network of neighborhood local streets, resulting in fewer trips on any one street away from the specific trailhead or at the individual intersections along SR 28. At the Regency Way trailhead, some of the vehicle-trips will be generated by residents living along Regency Way, resulting in lower volumes at the SR 267 intersection. While existing peak-season counts are not available at the Regency Way/SR 267 intersection, it can be concluded from the low traffic impact volumes that no significant impact on level of service would occur. It should also be noted that while SR 267 is a high-speed roadway, there is good sight distance for drivers entering from Regency Way. Overall, there would be no significant traffic circulation impacts associated with trail users.

## PARKING IMPACTS

The peak parking demand generated at the trailheads is a function of the trip generation as well as the average length of stay. Trip generation estimates based on user demand is discussed in Chapter III, above. Given observed trail use patterns at existing Tahoe facilities and the relatively short length of this trail segment, a reasonable average length of stay is 1.5 hours. Considering the hourly distribution of activity observed on nearby trails and the peak-hour trips forecast for the new trail segment, the following peak parking demand on a peak summer day is forecast:

- North Tahoe Regional Park—22 vehicles
- Carnelian Bay Avenue—4 vehicles
- Regency Way—3 vehicles

At the North Tahoe Regional Park, there are a total of 270 existing paved parking spaces (excluding those used for operational purposes) in the southeast portion of the park). These spaces support a wide range of recreational uses, including ballfields, tennis courts and picnic facilities. Staff reports that the parking capacity is only reached during major sport tournaments, while at other times most of the parking is not used. While many of these events occur during the fall season, a few (less than five) occur during the peak summer season when trail demand would also be highest. Given the low number of days in which the two peaks in parking demand would coincide, overall, there is adequate parking capacity to accommodate the new trail.

At Regency Way, the paved width of the roadway is approximately 20 to 22 feet, which is not sufficient to provide paved shoulder parking. Instead, drivers can be expected to choose to park along the unpaved shoulder within the 58-foot-wide right-of way. There is some evidence of this pattern occurring at present, just to the east of the dirt road. This use pattern is not expected to result in any significant safety or circulation impacts, given the geometrics of the area and low traffic volumes, though any off-pavement parking activity does result in soil compaction and disturbance.

At Carnelian Bay Avenue, the existing rough condition of the section of Carnelian Bay Avenue between the northernmost house and the trail and the approximately 10 percent grade would limit the proportion that choose to drive directly to the end of the trail, parking informally along Carnelian Bay Avenue. Most persons driving to this end of the trail would probably park along Tripoli Road. This road is approximately 28 to 30 feet in pavement width, within a right-of-way width of 50 to 62 feet. leaving approximately 20 to 22 feet in width if vehicles are parked along one side. There are good opportunities for this parking to occur without impeding access to driveways, particularly on the north side of Tripoli Road west of Carnelian Bay Avenue. Given the very low level of traffic activity at this location (as shown in Table 5) and the fact that the roadway geometrics limit traffic speeds, this low level of parking demand would not result in any potential for significant impact along Tripoli Road. To the degree that trail users choose to drive the unpaved portion of Carnelian Bay Avenue, one or two vehicles would park off the road in dirt areas adjacent to the end of the trail, resulting in soil compaction and disturbance.

## VEHICLE MILES TRAVELED IMPACTS

Vehicle-Miles Traveled (VMT) is a key measure of circulation impacts under the California Environmental Quality Act. An analysis was performed to calculate the change in Vehicle Miles Traveled (VMT) that can be expected with the use of the proposed trail. The following factors were considered:

- As discussed in Chapter 3, the use of the new trail for purpose (non-recreational) trips will be negligible. Therefore, there is no reduction in existing auto trips for commuting, shopping, etc. that can be attributed to the new trail.
- While the new trail will be a recreational amenity for area residents and visitors already in the area, it's relatively short length and location are such that it would not generate a significant amount of new auto trips into the region (such as from Truckee or Reno) simply to use the new trail.

- As evidenced by the high utilization levels of existing Class I trails in the region (such as the Dollar Creek Trail), there is a strong desire to access a Class I trail. The drive-to trail users defined in Chapter 3, in the absence of the new trail, would instead drive to another existing Class I trail further away. The area in which these trail users would be drawn from, given the distances to existing trails, is the Tahoe North Shore between Carnelian Bay on the west and Brockway on the east. As shown in Table 8, TRPA estimates of total overnight (resident and visitor) population by Traffic Analysis Zone (TAZ) were used to identify the proportion of the drive-to trips from each TAZ. These were then multiplied by the total drive-to vehicle-trips (in 1-way vehicle-trips) to estimate the daily vehicle-trips to/from each TAZ. The distances from each TAZ to the existing trail (at Dollar Hill) compared to the minimum drive distance to the closest access point to the proposed new trail were then calculated. Multiplying the reduction in vehicle-trip length by the number of vehicle-trips and summing over all TAZs yields a total reduction of 1,226 VMT per day.
- VMT would also be generated by construction traffic activity. As a short-term event, however, this source of VMT is not considered further.

In sum the proposed trail will reduce regionwide VMT by an estimated 1,226 per day.

**TABLE 8: Analysis of VMT Impacts**

| Traffic Analysis Zone | Community | Total Population (1) | % of Total Population | Daily Drive-To 1-Way Vehicle-Trips | Drive Distance to Trail (Mi) | | | Change in Daily VMT |
|---|---|---|---|---|---|---|---|---|
| | | | | | Existing Trail | New Trail | Change | |
| 176 | Carnelian Bay | 49 | 1% | 2 | 2.6 | 2.0 | -0.6 | -1 |
| 177 | Carnelian Bay | 66 | 1% | 3 | 2.9 | 1.7 | -1.2 | -4 |
| 178 | Agate Bay | 280 | 4% | 12 | 4.1 | 0.7 | -3.4 | -41 |
| 179 | Carnelian Bay | 107 | 1% | 4 | 2.9 | 2.0 | -0.9 | -4 |
| 180 | Agate Bay | 225 | 3% | 9 | 4.8 | 1.2 | -3.6 | -32 |
| 181 | Tahoe Vista | 1,380 | 19% | 57 | 5.3 | 1.7 | -3.6 | -205 |
| 182 | Tahoe Vista | 415 | 6% | 17 | 6.2 | 1.9 | -4.3 | -73 |
| 183 | Kingswood | 270 | 4% | 11 | 7.4 | 3.0 | -4.4 | -48 |
| 184 | Regency Way | 54 | 1% | 2 | 7.8 | 0.5 | -7.3 | -15 |
| 186 | Regency Way | 283 | 4% | 12 | 9.5 | 1.0 | -8.5 | -102 |
| 188 | Kingswood | 251 | 4% | 10 | 9.1 | 1.4 | -7.7 | -77 |
| 189 | Kings Beach | 391 | 5% | 16 | 6.6 | 2.6 | -4.0 | -64 |
| 190 | Kings Beach | 2,228 | 31% | 93 | 6.7 | 2.7 | -4.0 | -372 |
| 191 | Brockway | 661 | 9% | 27 | 7.5 | 3.5 | -4.0 | -108 |
| 192 | Brockway | 479 | 7% | 20 | 7.4 | 3.4 | -4.0 | -80 |
| **TOTAL** | | **7,140** | | **297** | | | | **-1,226** |

Note 1: Source, TRPA TransCAD model data. Includes both residents and overnight visitors.

## CONSTRUCTION TRAFFIC IMPACTS

Construction traffic will occur on the roadway network adjacent to the trail. The heaviest construction period occurs during site grading and associated construction of rock walls. This is expected to require the import of a total of 4,500 cubic yards of material.

This analysis calculates the number of truck trips associated with site grading based on a planned 100-day construction period for rough grading and rock wall construction. Trucks with a capacity of 10 cubic yards are planned to be used. This indicates the generation of 450 truck roundtrips for fill import, or an average

of roughly 5 truck roundtrips per day. Due to the time required for handling materials, haul truck movements tend to be spread out over time.

In addition to construction haul trips associated with grading, construction employees will also generate temporary trips. Each worker (10 employees on average) will generate an average of 3 daily trips based on information on employee trips (for employment uses) from the Institute of Transportation Engineering Trip Generation, 10th Edition.

The access route used by construction traffic will vary depending on the specific work site location. Overall, construction traffic will not degrade roadways or intersection LOS, and therefore, causes no significant short-term impact.

The County should prepare a Traffic Control Plan for review and approval by TRPA and Caltrans prior to construction. As described in Chapter 2, the Traffic Control Plan addresses project construction traffic and parking. At a minimum, the plan should identify truck haul routes, traffic control signage, bicycle and pedestrian traffic, restriction of hauling activities to off-peak days or off-peak periods on peak days, on-site circulation and staging areas, worker parking locations and monitoring of the in-place traffic control to implement traffic control revisions, if necessary. Prior to construction, the County should obtain necessary encroachment and transportation permits.

# References

*2006 TRPA Threshold Evaluation*, Tahoe Regional Planning Agency, 2007.

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