Appendix E

Mammoth Lakes Vehicle Miles Traveled Analysis (LSC, 2012)

TRANSPORTATION PLANNING AND
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TECHNICAL MEMORANDUM

DATE: August 3, 2012

TO: Ellen Clark, Town of Mammoth Lakes

FROM: Sara Hawley, PE and Leslie Suen, EIT, LSC Transportation Consultants, Inc.

SUBJECT: Mammoth Lakes Vehicle Miles Traveled Analysis

As requested, LSC Transportation Consultants, Inc. has completed the analysis of Vehicle Miles Traveled (VMT) for the Town of Mammoth Lakes for use in the preparation of a Greenhouse Gas (GHG) inventory and an update to the 1990 Air Quality Management Plan. This memo presents the townwide VMT by roadway speed, as well as a limited analysis of VMT for external trips.

VMT by Travel Speed

Using the 2011 Town of Mammoth Lakes TransCAD Travel Model, VMT was calculated and grouped into speed classes based on the 85th-percentile roadway speed, as shown in Table 1. VMT is calculated by multiplying the length of a roadway segment by the volume on that roadway. A map of the roadway speeds for all the roads in the model can be found in Appendix A, attached. Also shown in Appendix A are all the roadways included in the VMT analysis, which total approximately 240 roadways with 1,037 segments. The model reflect a typical winter Saturday, which will subsequently be called a 'peak day' throughout this report. Peak day conditions for both existing 2009 and future 2030 (reflecting build out of the general plan) scenarios were taken directly from the model. As indicated, a total of approximately 144,192 VMT are estimated to be generated in Mammoth over the course of an existing peak winter day, and approximately 179,708 VMT are estimated to be generated on a peak day in the future. This indicates a 25 percent increase by the time that buildout of the General Plan occurs (estimated at the year 2030).

In order to estimate annual average day conditions, peak day VMT was factored using Caltrans data along State Route (SR) 203. Specifically, daily traffic volumes at six locations on SR 203 within the Town of Mammoth Lakes were reviewed. As shown in Table 2, the percent decrease between peak month average daily traffic (Peak Month ADT) and annual average daily traffic (AADT) ranges from approximately 17 percent to 29 percent. The weighted average percent decrease is calculated to be about 23 percent. This reduction was applied to the model's peak day VMT results, in order to estimate the VMT on an annual average day. As shown on the right side of Table 1, a total of approximately 111,287 VMT are estimated to be generated in

Mammoth over the course of an existing annual average day, and approximately 138,698 VMT are estimated to be generated on an average day in the future.

In 1990 a similar VMT study was completed in combination with the *Air Quality Management Plan for the Town of Mammoth Lakes* (November 30, 1990). The methodology used in the 1990 study and this VMT study are similar. Both studies are based on a travel demand model that assumes full buildout of the Town's General Plan in the future. Both studies include all of the Town's major roadways. The main difference is the extent of the roadways analyzed in each study. The 1990 study had a total of 10.9 miles of roadways on 8 different roads (with 17 segments) for the existing year 1990 VMT, while the future year 2005 had a total of 15.8 miles of roadways on 10 different roads (with 31 segments). In contrast, this study's VMT analysis included 93.1 miles of roadways on 420 different roads (with 1,037 segments) for both the existing and future analysis years. The higher number of miles of roadways included in this VMT analysis produces higher VMT estimates than the 1990 study. Additional comparison between the two studies can be found in the attached memo *Mammoth Lakes Vehicle Miles Traveled Analysis – Comparison with 1990 Study* (LSC, September 10, 2012).

External VMT

LSC reviewed information provided in the existing model at the two external points representing trips to/from Highway 395 - one on SR 203 east of Meridian Boulevard and one on Mammoth Scenic Loop north of town. Nearly all (approximately 97 percent) of the trips that enter and exit the model area use SR 203 to the east. A total of 8,880 vehicles are estimated to pass through the external points over the course of a peak day (total in both directions). Of the total number of trips generated in the Mammoth Lakes model area, about 15 percent are external trips, meaning they have either an origin or destination outside the model area. It should be noted that as the peak day of traffic activity is a winter Saturday, these figures do not reflect the many recreational trips occurring on a Friday or Sunday.

Trip Types

External trips can be broken down into the following five model trip types:

- home-based work
- home-based shopping
- home-based recreation
- home-based other
- other to other (example: work to shopping)

The large majority of the external trips (approximately 88 percent) are home-based recreation trips, such as a trip made by a person staying in Bishop and skiing in Mammoth Lakes, or staying in Mammoth and going elsewhere for recreation. The remaining 12 percent of trips are equally distributed among the other trip types, with approximately 3 percent of each trip type, as shown in Table 3.

Future external trips were also obtained from the model, and they are presented in Table 4. Again, the majority (85 percent) of the future external trips are generated by home-based recreation trips.

Residents vs Visitors

Trips going through the external points in the model were reviewed with respect to trips made by residents versus visitors. A precise breakdown cannot be provided based on available data. However, it is assumed that the majority of the external trips on a peak winter day are made by visitors, given that most of the external trips are "home-based recreation" trips, which is a trip type primarily associated with visitors. It is also expected that the majority of home-based shopping trips are made by visitors. The remaining trip types (home-based work, home-based other, and other to other) are not assumed to be made by visitors.

Similarly, the split of residents versus visitors for internal trips cannot be provided based on available data. However, a general breakdown can be made based on the number of resident dwelling units and visitor dwelling units. In the TransCAD model, there are about 5,600 existing resident dwelling units and 5,000 visitor dwelling units (which include single-family vacation homes and lodging units). As the trip generation rate in the model is slightly higher for residential units, the total number of trips generated by residents is nearly equal to the total trips generated by visitors. Furthermore, the trip lengths for internal trips made by residents and visitors are assumed to be similar. Therefore, the resident/visitor split for VMT internal to Mammoth Lakes is estimated to be roughly a 50/50 split.

Residence Locations of Commuters

Data from the US Census 2010 indicates that more than half (approximately 57 percent) of persons who work in Mammoth Lakes also reside in Mammoth Lakes. About 12 percent of persons employed in Mammoth Lakes live in Bishop, California, with the remaining 31 percent residing in various locations throughout the Eastern Sierra. Of the workers commuting to Mammoth Lakes from external points, about 58 percent are estimated to reside in points to the north of Mammoth along US 395 and 42 percent are estimated to live to the south. Detailed percentages for each town in the Eastern Sierra are shown in Figure 1. Note the census data includes the Mammoth Yosemite Airport within the Mammoth Lakes analysis area.

Of all workers residing in Mammoth Lakes, almost all (approximately 96 percent) are employed in Mammoth Lakes. In other words, very few persons living in Mammoth Lakes leave the community to go to work.

Residence Locations of Visitors

The residence locations of visitors traveling to Mammoth Lakes from more remote destinations was reviewed, based upon data provided in the *Town of Mammoth Lakes Winter Survey* (Leisure Trends Group, 2007). Based on this survey, and shown in Figure 2 the home regions of all visitors to Mammoth include:

- Greater Los Angeles Area – 29%
- Outside California – 17%
- Orange County – 16%
- San Diego County – 14%
- Central Valley and Northern California – 13%
- Central Coast – 11%

The top home states for the 17 percent of visitors from outside California are Nevada, Maryland, Texas, Washington, Idaho, Arizona, Oregon and Utah (each state representing four percent or less of all visitors).

Trips to/from Mammoth Yosemite Airport

According to the 2007 Winter Survey, almost all respondents arrived via private automobile and no respondents reported flying to the Mammoth Yosemite Airport. This is unsurprising since commercial air service was not available at this time, but has since become available. Many hotels in Mammoth provide a free shuttle service to and from the airport in connection with flight times, and rental cars and taxi service are available at the airport. While it is difficult to quantify exactly how many trips from various locations may have shifted from driving to flying since air service started, it is probable that at least a small portion of previous driving trips are now made by air. However, this shift is likely to be accompanied by a certain number of new airport-related trips including employee and passenger trips to and from Mammoth, and new visitors. Overall, the net change to VMT associated with airport-related trips is likely negligible relative to total daily trip volumes.

Estimate of Total External VMT

In order to determine the total VMT associated with activity in the Town of Mammoth Lakes, the VMT of the external part of the external trips (i.e. outside of the model area) needs to be considered. In VMT analyses for communities with high levels of visitor/tourism activity, some portion of the trip length that occurs outside the model area is typically allocated to the study community. For example, in recent VMT analyses conducted in Shasta County and in the Lake Tahoe area, 50 percent of the external VMT were allocated to the study area. For the purposes of this analysis, 100 percent of the external VMT is allocated to Mammoth Lakes.

To estimate the external VMT, the approximate mileage between Mammoth and each of the external locations shown in Figures 1 and 2 was estimated for each trip type. Of the home-based recreation trips, about 10 percent are assumed to be made to/from the Bishop area, reflecting that some visitors stay overnight at locations near Mammoth as a part of their trip, and that visitors staying in Mammoth will recreate in locations outside of the town itself. The remainder is allocated proportionately to the various points of visitor origin indicated in the 2007 survey. Multiplying the mileage by the number of external trips for each trip type yields the external VMT by trip type, as shown in Table 5.

Note all external VMT was calculated based on the TransCAD traffic model which estimates a busy winter Saturday, which when the highest traffic volumes occur in Mammoth Lakes but may not be when the peak external trips occur. A general estimation can be made of average annual daily VMT by reducing the peak VMT by 23 percent, which is the same percent internal VMT was reduced, as shown in Table 5.

Total Yearly VMT

Total VMT for one year is estimated based on the assumption that visitors' home regions are similar in the summer and winter, as indicated in the *Town of Mammoth Lakes Winter Survey* (Leisure Trends Group, 2007) and *Town of Mammoth Lakes Summer Survey* (Leisure Trends Group, 2008). Adding the existing internal annual average VMT (111,287) to the external annual average VMT (1,730,000) yields a total of about 1,841,000 VMT per annual average day. Multiplying this total by 365 days per year yields about 672 million existing VMT per year. A similar calculation can be done for future VMT, which results in a total of about 705 million VMT per year in 2030.

Table 1: Town of Mammoth Lakes Vehicle Miles Traveled Per Day

Roadway Speed (miles per hour)	Daily Vehicle Miles Traveled			
	Peak Day		Annual Average Day	
	Existing	Future	Existing	Future
25 or less	22,066	31,452	17,030	24,274
30	2,288	3,053	1,766	2,356
35	n/a	n/a	n/a	n/a
40	28,421	37,623	21,935	29,037
45	6,383	9,937	4,926	7,669
50	72,510	83,935	55,963	64,781
55	12,524	13,708	9,666	10,580
All	**144,192**	**179,708**	**111,287**	**138,698**

Note: In the Mammoth Lakes TransCAD model no roadways have a 35 mph speed.
Note: Includes VMT within Mammoth Lakes associated with internal and external trips.
Source: LSC Transportation Consultants, Inc.

Table 2: Daily Traffic Volumes on Highway 203 in Mammoth Lakes

Highway	Post Mile	Location	Peak Month Daily Traffic	Annual Average Daily Traffic	Percent Decrease to Convert Peak Month to Annual Average Day
203	2.35	MAINTENANCE SUBSTATION	4,500	3,750	17%
203	4.49	MAMMOTH, FOREST TRAIL	4,500	3,650	19%
203	4.78	LAKE MARY /MINARET RD	12,100	9,700	20%
203	5.75	OLD MAMMOTH RD	16,700	13,250	21%
203	6.87	MERIDIAN BLVD	9,600	6,850	29%
203	8.56	JCT. RTE. 395	11,100	7,950	28%
				Weighted Average	**23%**

Source: California Department of Transportation http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/

Table 3: Existing Peak Day Daily Vehicle Trips at External Points
(Total in Both Directions)

External Points	Trip Type: Home Based Recreation	Home Based Shopping	Home Based Work	Home Based Other	Other to Other	Total
Highway 203 East (TAZ 700)	7,565	235	268	269	257	8,594
Mammoth Scenic Loop (TAZ 701)	257	7	7	8	8	287
Total Daily Traffic	**7,822**	**242**	**275**	**277**	**264**	**8,880**
Percent of Total	88%	3%	3%	3%	3%	100%

TAZ = Traffic Analysis Zone

Source: LSC Transportation Consultants, Inc.

Table 4: Future Peak Day Daily Vehicle Trips at External Points
(Total in Both Directions)

External Points	Trip Type: Home Based Recreation	Home Based Shopping	Home Based Work	Home Based Other	Other to Other	Total
Highway 203 East (TAZ 700)	7,798	280	382	372	366	9,198
Mammoth Scenic Loop (TAZ 701)	248	8	10	12	10	288
Total Daily Traffic	**8,046**	**288**	**392**	**384**	**376**	**9,486**
Percent of Total	85%	3%	4%	4%	4%	100%

TAZ = Traffic Analysis Zone

Source: LSC Transportation Consultants, Inc.

Table 5: External Vehicle Miles Traveled Per Day

Trip Type	Daily Vehicle Miles Traveled			
	Peak Day		Annual Average Day	
	Existing	Future	Existing	Future
Home Based Recreation	2,199,000	2,262,000	1,697,000	1,746,000
Home Based Shopping	10,000	12,000	8,000	9,000
Home Based Work	12,000	17,000	9,000	13,000
Home Based Other	11,000	16,000	8,000	12,000
Other to Other	11,000	15,000	8,000	12,000
Total	**2,243,000**	**2,322,000**	**1,730,000**	**1,792,000**

Note: Only includes miles associated with the external portion (i.e. outside the model area) of the trips.

Source: LSC Transportation Consultants, Inc.