Douglas County/Carson City Travel Demand Model

FINAL REPORT

Nevada Department of Transportation

Douglas County

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1. INTRODUCTION

This document describes the estimation and validation of the Douglas County/Carson City Model that was developed for the counties of Douglas and Carson City in northern Nevada.

The Douglas County/Carson City Travel Demand Model (hereafter referred to as Travel Demand Model) represents an evolution of travel forecasting models and model components previously developed for Carson City and Douglas Counties.

Prior to the completion of the model calibration described in this document, a significant effort was undertaken to improve the accuracy of the planning variable database, particularly with regard to households and employment variables. This re-estimation of base year planning variables was undertaken for the 2005 timeframe based on a detailed accounting of dwelling units—available from the County Assessor's office, and employer records—available from the Nevada Department of Employment, Training and Rehabilitation.

The Travel Demand Model covers the two counties of Douglas and Carson City. The Travel Demand Model has seven gateways representing the major roadways in and out of these two counties. The illustration which follows (Figure 1-1) provides a flow chart of the overall model structure.

The Douglas County/Carson City Travel Demand Model is designed to operate with TransCAD software, which is used by the Nevada Department of Transportation for planning projects throughout the state. TransCAD is a geographic information system (GIS) designed specifically for use by transportation professionals to store, display, manage, and analyze transportation data. TransCAD combines GIS and transportation modeling capabilities into a single integrated platform that can be used for all modes of transportation, at any scale or level of detail. TransCAD provides:

- A powerful GIS engine with special extensions for transportation
- Mapping, visualization, and analysis tools designed for transportation applications
- Application modules for routing, travel demand forecasting, public transit, logistics, site location, and territory management

TransCAD is a GIS that can be used to create and customize maps, build and maintain geographic data sets, and perform many different types of spatial analysis. TransCAD includes sophisticated GIS features such as polygon overlay, buffering, and geo-coding, and has an open system architecture that supports data sharing on local- and wide-area networks.

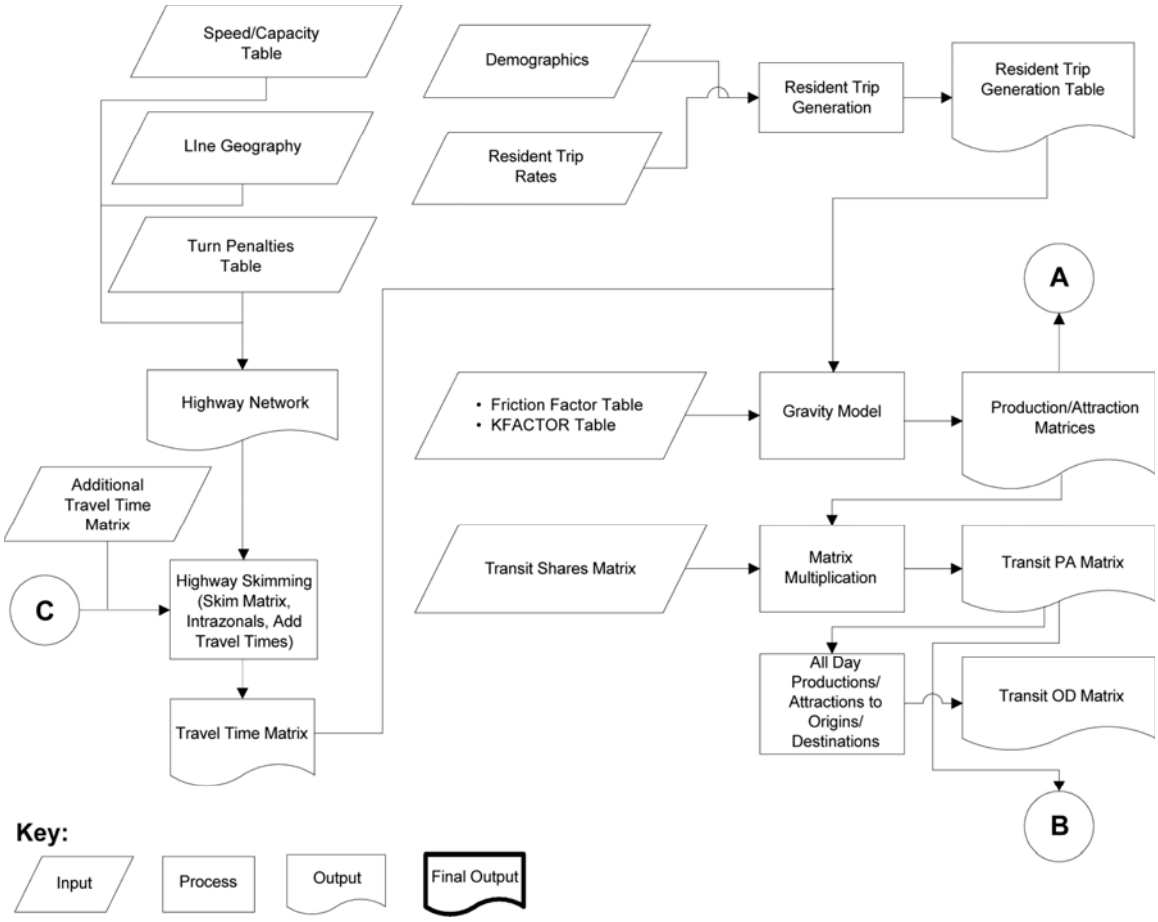


Figure 1-1: Douglas County/Carson City Model Flow Chart (1 of 2)

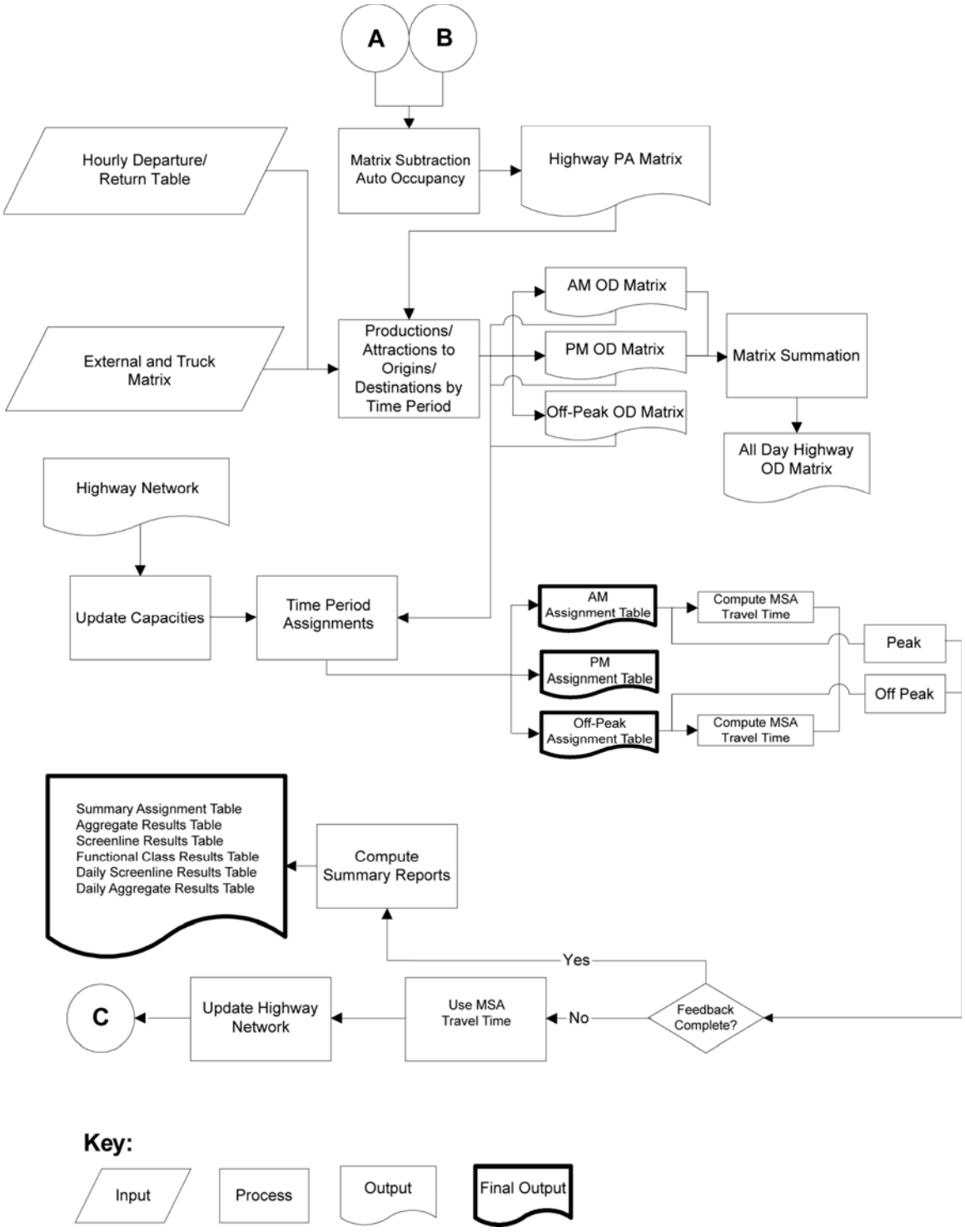


Figure 1-1: Douglas County/Carson City Model Flow Chart (2 of 2)

2. DEMOGRAPHIC INFORMATION

Zone Structure

The entire counties of Douglas and Carson City are currently being modeled by the Travel Demand Model. The Travel Demand model is subdivided into 324 internal transportation analysis zones (TAZ) and seven external stations for travel demand forecasting purposes. The resulting 331 zones are used for all travel demand forecasts.

External stations have been defined for all major roadways crossing the two counties. The Following table 2-1 shows the location of the seven external stations.

Table 2-1: Location of External Gateways in the Travel Demand Model

Gateway/ TAZ #	Roadway	Location
1	US 50	Located on the east end of Carson City
2	Goni Road	Located on the north end of Carson Ciity
3	US 395	Located on the north end of Carson City
4	Hwy 28	Located on the west end of Carson City
5	US 50	Located on the west end of Carson City
6	Hwy 88	Located on the south end of Douglas County
7	US 395	Located on the south end of Douglas County

Demographic Forecasting Needs

Travel models require a number of data items to be counted or estimated for each TAZ in the region. These items are as follows:

- ***Occupied Households*** are the occupied dwelling units in each TAZ. Vacant dwelling units and group quarters are not included in the household projections. "Vacant dwelling units" are determined using two variables, one representing "occupied households" and the other representing "dwelling units." The 2000 U.S. Census information produces both of these variables. The difference between these two numbers provides the number of vacant dwelling units. Households by TAZ are the primary data used to estimate trip productions.
- ***Population in Households*** is used in conjunction with household data to estimate average household size for each TAZ. Population in group quarters is not included in the household population projections. Population in households is used in conjunction with households to estimate average household size for each TAZ and distributions of households by household size.
- ***Median Household Income for each TAZ*** has been summarized from the 2000 Census data and is expressed in 1999 dollars. This data is used to estimate distributions of households by income group for the modeling process. Income level is a strong explanatory variable for trip generation.
- ***Hotel Employment*** is defined as employment in the hotel industry, which is one of the planning variables in the model. Employment is defined at the work location; thus, one

worker from a household might be counted as two employees if that worker held multiple jobs. It is not possible to determine if a worker held more than one job using current U.S. Census data. All employment information is based on the data provided by the employer.

- ***Industrial Employment*** is defined as employment in the manufacturing industry. It includes employment in categories such as mining, manufacturing and transportation. Employment is defined at the work location. The employees are defined at the work location.
- ***Office Employment*** includes employment in finance and real estate, personal services, business services, and government. As with industrial employment, employees are defined at the work location.
- ***Retail Employment*** is defined as employment in the retail industry and includes shopping malls and specialty stores. The Retail Employment category is further subdivided into Retail-Shops, Commercial-Shops and Other-Retail. As with basic industrial employment, employees are defined at the work location.
- ***Other Non-retail Employment*** is defined as employment in the non-retail industry, like hospitals, service/industry, etc. As with basic industrial employment, employees are defined at the work location.
- ***Elementary and Middle School Enrollment (F18)*** is the student enrollment at public and private elementary and middle schools. Enrollment is defined at the school location.
- ***High School Enrollment (F912)*** is the student enrollment at public and private high schools. Enrollment is defined at the school location.
- ***College Enrollment (F13)*** is the student enrollment at public and private colleges. Both part-time and full-time students are included. Enrollment is defined at the school location.

In addition to the above data items, the number of internal-external vehicle trips at each external station is projected. The internal-external trips include all trips inbound to the study area and outbound from the study area, but exclude all through trips (not stopping in the study area). Through trips, being a very small percentage of all the external trips, are not specified in the model. The estimates of internal-external trips included with the Travel Demand Model are consistent with existing counts for the base year. Estimates of future year internal-external trips were developed based on population growth for that appropriate year.

Base Year (2005) Socioeconomic Data Summaries

The base year data for households was obtained from the County Assessor's office and city records. This information at the parcel level was aggregated to the TAZ level for the Carson City and Douglas County area. Employment information was obtained from the Nevada Department of Employment, Training and Rehabilitation. Median income data was obtained from the Year 2000 Census data at the block group level and was appropriately distributed at the TAZ level.

The Travel Demand Model was divided into three jurisdictions based on county boundaries as shown in Figure 2-1. Table 2-2 reports the base year summaries by jurisdictions. Jurisdiction 1 represents Carson City, Jurisdiction 2 represents Douglas County, and Jurisdiction 3 represents the external stations.

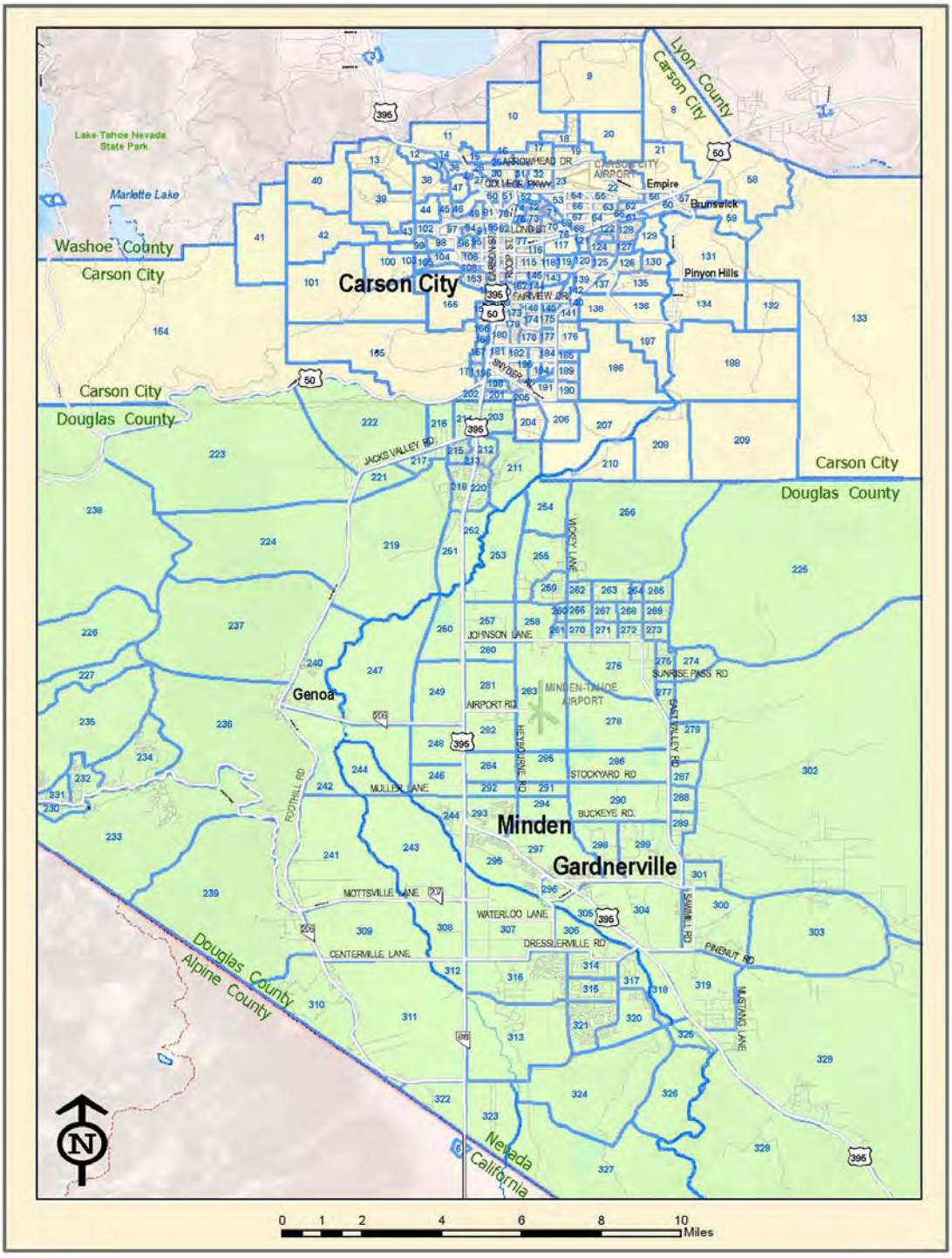


Figure 2-1. Douglas County and Carson City Transportation Analysis Zone (TAZ) Map

Table 2-2. Douglas County/Carson City Socioeconomic Data for 2005

Jurisdiction	ID	POP	DU	OCC DU	TOT EMP	HOTEL	OFFICE	INDUS
Carson City	1	58,016	24,852	23,490	26,059	2,213	12,636	5,359
Douglas County	2	51,948	24,490	20,610	19,563	6,954	4,857	3,630
Total		109,964	49,342	44,100	45,622	9,167	17,493	8,989

Jurisdiction	ID	RETAIL	NON RETAIL	ELE & MIDDLE SCHOOL	HIGH SCHOOL	COLLEGE
Carson City	1	5,339	512	5,695	2,574	3,151
Douglas County	2	3,947	175	5,144	1,785	705
Total		9,286	687	10,839	4,359	3,856

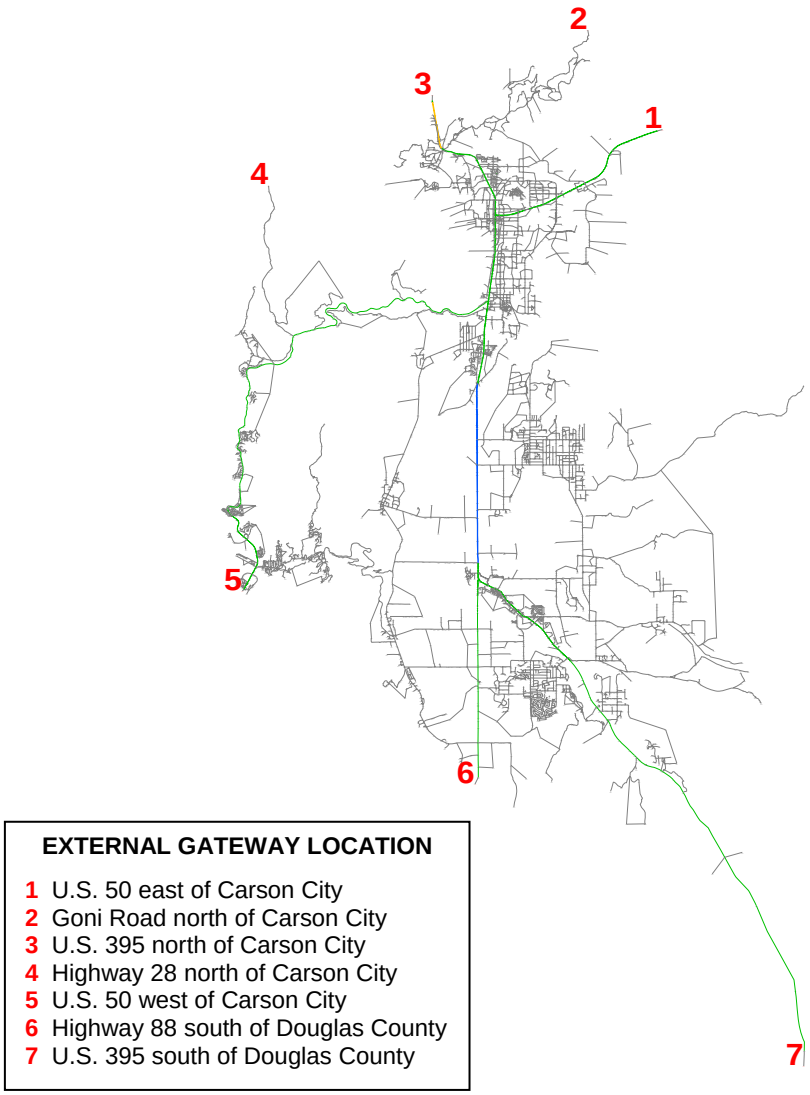
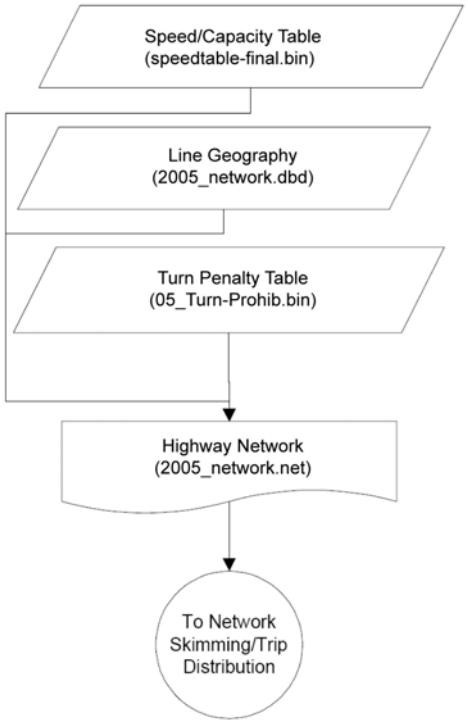


Figure 2-2. External Gateway Locations for the Travel Demand Model

3. HIGHWAY NETWORK

Network Development



Transportation Analysis Zones and Highway Geographic Database

Both the highway network and the transportation analysis zones (TAZ) are based on a 331 zone structure. Of these zones, zone numbers 1 to 7 are external zones and zone numbers 8 to 331 are internal zones. The TAZ geography is included as a TransCAD geographic database in the model. However, this database is not used in any model run. The TAZ geography exists so that users can link model inputs and outputs (e.g. demographics and output trips) to the files and view results geographically. TransCAD uses the zone network in conjunction with the highway network to assign trips from the zones to the highways.

The highway network is represented as a GIS geographic file. Both the attributes and the geography of the network are maintained in the TransCAD GIS. The geographic file uses shaping between nodes to accurate define both the true geography and true distances of the network links. The geographic shape of the street segments are derived from the Carson City and Douglas County GIS streets file, aerial images and TIGER/Line files.

Network attributes include roadway classification type, area classification types, segment lengths and other road design-based attributes which are used for classification of free-flow speeds and capacities. Another set of attributes are free flow speed, alpha, beta and capacity exceptions for individual links, which can be used to override the default values that are applied on a global basis. These values are variables used in the trip distribution equations. A full listing of the network attributes is listed in Table 3-1.

Table 3-1: Network Attributes

FIELD_NAME		DESCRIPTION
ID	*	unique Link Identification Number
Length	*	Length of the link in miles
Dir	*	one-way or 2-way links (Dir 0 = 2-way link, Dir 1 = 1-way link)
NAME	*	Street Name
FTYPE_NUM	*	Integer form of the Functional Class of a link
FTYPE_NAME	*	Type of Functional Class
ATYPE_NUM	*	Integer form for Area Type
ATYPE_NAME	*	Description of Area Type (i.e. suburban, rural, etc.)
AB_LANES	*	Number of Lanes on AB Direction of Link
BA_LANES	*	Number of Lanes on BA Direction of Link
UNIT	*	Must have a Value of 1
DAY_LANE_CAP		Daily Capacity per Lane
HOUR_LANE_CAP		Hourly Lane Capacity
AB_SPEED		Free-flow Speed on AB Direction of Link (mi/hr)
BA_SPEED		Free-flow Speed on BA Direction of Link (mi/hr)
ALPHA		BPR Coefficient
BETA		BPR Exponent
ALT_BETA		Alternative BPR Coefficient for a link
ALT_CAP		Alternative Capacity for a link
ALT_SPEED		Alternative Speed for a link
AB_TIME		Free Flow Travel Time in AB Direction of Link (computed as Length/AB_SPEED * 60)
BA_TIME		Free Flow Travel Time in BA Direction of Link (computed as Length/BA_SPEED * 60)
AB_TIME_PK		For First Iteration =*Time, else time is AMPEAK
BA_TIME_PK		For First Iteration =*Time, else time is AMPEAK
AB_TIME_OPK		For First Iteration =*Time, else time is OFFPEAK
BA_TIME_OPK		For First Iteration =*Time, else time is OFFPEAK
AB_TIME_AVG		For First Iteration =*Time, else Weighted Average of (AMPEAK, PMPEAK & OFFPEAK)
BA_TIME_AVG		For First Iteration =*Time, else Weighted Average of (AMPEAK, PMPEAK & OFFPEAK)
AB_HR_CAP		One Hour Link Capacity
BA_HR_CAP		One Hour Link Capacity
AB_10HR_CAP		Offpeak Capacity is equal to 10* Hour Link Capacity
BA_10HR_CAP		Offpeak Capacity is equal to 10* Hour Link Capacity
AB_DAY_CAP		Daily Link Capacity
BA_DAY_CAP		Daily Link Capacity
AB_COUNT_AM	**	am peak hour Counts
BA_COUNT_AM	**	am peak hour Counts
AB_COUNT_PM	**	pm peak hour Counts
BA_COUNT_PM	**	pm peak hour Counts
AB_COUNT_OP	**	offpeak period Counts
BA_COUNT_OP	**	offpeak period Counts
AB_ALLCOUNT	**	Daily Counts
BA_ALLCOUNT	**	Daily Counts
INCLUDECOUNT	**	1 indicates link will be used for comparisons of count to peak/offpeak hour traffic volumes
INCLUDEALLCOUNT	**	1 indicates link will be used for comparisons of count to daily traffic volumes
SCREENLINE	**	1 indicates the link will be used for hourly count calculations
SCREENLINEALL	**	1 indicates the link will be used for daily count calculations
JURISDICTIONS		Jurisdiction boundaries
KFACTOR_DISTRICTS		kfactor districts based on links

Field names denoted with a "*" are required fields for the model. Field names denoted with a "**" are required only in the model option that compares count information with model flow results.

The highway network also contains traffic counts compiled by Parsons that were obtained primarily from NDOT. Both hourly and daily 2005 base year Annual Average Daily Traffic (AADT) counts were based on traffic counts taken during 2003, 2004 and 2005. This data was entered into the highway network input files for model validation, providing a comparison between counts and model forecasts. For more information, see page A-1 of Appendix A in the traffic model report. All hourly counts are based on 2003/2004 estimates and only weekday counts were included. In cases where more than one count existed on the same roadway segment, an average count was calculated. In other cases where a line segment had both hourly and AADT counts, the hourly counts were factored to the AADT count since it was assumed that AADT counts are more accurate.

Node Attributes

In TransCAD, nodes are an additional layer in the highway geographic database with unique ID's and optional attribute fields. In the Travel Demand Model, the first 331 node IDs are designated as the centroids. There is also a field in the nodes called "TAZ" that has the traffic analysis zone number for centroids nodes.

Highway Network (.NET) Creation

From this line geographic file, a TransCAD network is created. The network uses the fields LENGTH, FTYPE_NUM, *TIME, *_HR_CAPACITY, *10HR_CAPACITY, ALPHA, and BETA. Centroids have also been set in this network. The model includes a button that automatically recreates the highway network. The model also has a supplementary input file (speed-capacity lookup table), which is used to help create the network. The values of this speed-capacity lookup table are documented in Tables 3-2 and 3-3. Table 3-4 represents the cross-classification lookup value for the Facility and Area types

Table 3-2: Hourly Capacities (vehicles per hour per lane) Used for the Travel Demand Model

	Area Types		
Functional Class	**Central Business District (CBD)**	**Urban**	**Rural**
System ramps	2,000	2,000	2,000
Minor arterials	600	700	800
Major arterials	700	800	900
Ramps	1,600	1,600	1,600
Interstates	2,000	2,000	2,000
Freeways	2,000	2,000	2,000
Expressways	1,100	1,200	1,400
Collectors	500	600	700
Externals	99,999	99,999	99,999

Table 3-3: Free-Flow Speeds (miles per hour) Used for the Travel Demand Model

Functional Class	Area Type		
	CBD	Urban	Rural
System ramps	40	45	50
Minor arterials	30	35	45
Major arterials	35	45	50
Ramps	20	30	40
Interstates	50	55	60
Freeways	50	55	60
Expressways	45	50	55
Collectors	25	35	40
Externals	50	50	50

Table 3-4: Facility Type and Area Type Classification in the Travel Demand Model

Functional Class	Facility	CBD	Urban	Rural
System ramps	1	1	2	3
Minor arterials	2	1	2	3
Major arterials	3	1	2	3
Ramps	4	1	2	3
Interstates	5	1	2	3
Freeways	6	1	2	3
Expressways	7	1	2	3
Collectors	8	1	2	3
Centroids	9	6	6	6
Externals	0	99	99	99

The speed-capacity lookup table automatically fills in link speeds, hourly and daily lane capacities and link alpha and beta values by functional classification and area type. By matching up the FTYPE_NUM and ATYPE-NUM fields in the network with this lookup table, the model automatically fills in the following fields: DAY_LANE-CAP, HOUR_LANE_CAP, AB_SPEED, BA_SPEED, AB_TIME, BA_TIME, ALPHA, BETA, AB_HR_CAP, BA_HR_CAP, AB_10HR_CAP, BA_10HR_CAP, AB_DAY_CAP and BA_DAY_CAP. The model also uses the fields AB_LANES, BA_LANES and UNIT as inputs network fields. Appendix A describes all of the fields in this table.

Turn Penalties Table

A turn penalties file is also included within the model stream. The turn penalties file is based on nodes and reflects, on a from-link to to-link basis, prohibitions and delays from certain turn movements from occurring during the traffic assignment process. The turn penalties are embedded into the network during network creation and affect the highway skimming and highway assignment sections of the model. Skim is a unit of measurement (time, distance, cost, etc.) between two TAZ. The following table describes the fields of the table:

Turn Penalties Table (xx_Turn-Prohib.bin)*

Field	Description
FROM_ID	From Link ID
TO_ID	To Link ID
PENALTY	Penalty Value, missing value denotes a prohibition

Base Year Network Road Classification

Figure 3-1 illustrates the classification of roadways coded in the Year 2005 Highway Network. The roadway network was developed from scratch using the TIGER files as a starting point and refining the roadway classifications as appropriate. This roadway network along with the roadway classification was used for the model development and validation purposes. The centroids are not plotted in this figure to allow better visibility of the roadway network.

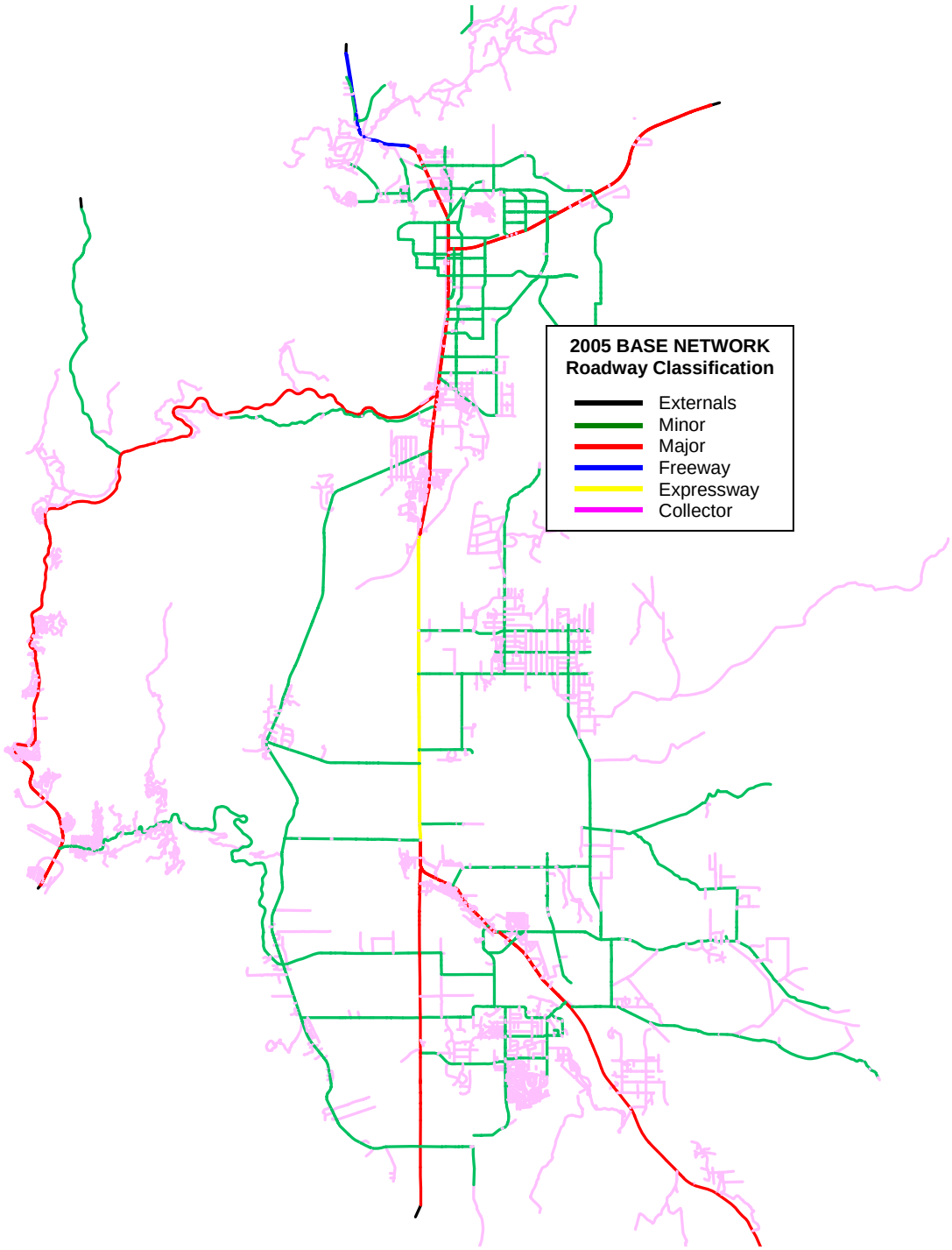
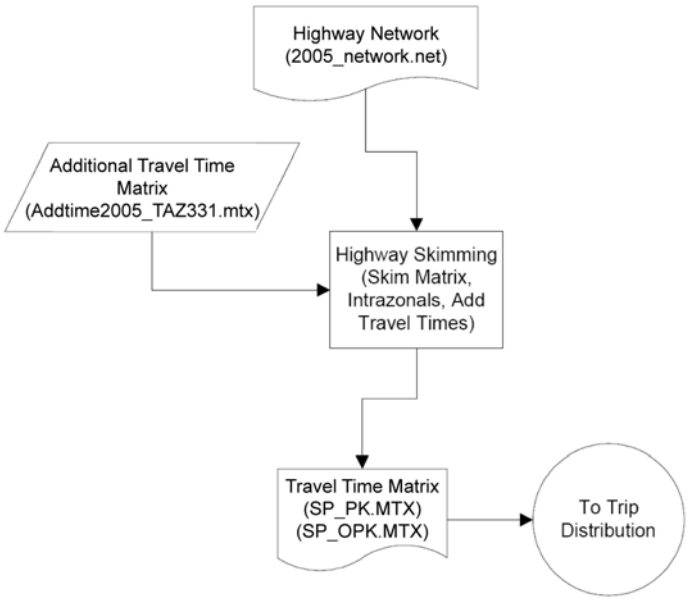


Figure 3-1: Year 2005 Douglas County and Carson City Highway Network

Highway Skims



Once the highway network is created, the model performs highway skims from centroid node to centroid node. The travel time is "minimized" and travel distance is skimmed. Both the offpeak and peak travel periods (8:00–9:00 a.m. and 5:00–6:00 p.m.) are skimmed as input to the downstream models. To calculate the offpeak skims, free-flow travel times are used, which are derived from the formula: GIS Length/Free-Flow Speed * 60. To calculate the peak skims, congested travel times are used. Congested travel times are calculated from the output of previous traffic assignments and are described in more detail in the Assignment section of this document.

After the peak and offpeak travel time matrices are calculated, intrazonal travel times are calculated and then origin and terminal times are added to them. The procedure used for calculating intrazonal travel times was the closest neighbors approach. For each row origin, the travel time to its two closest neighbors is found from the matrix. The intrazonal time is computed as one half of the travel time to its closest neighbor.

After intrazonal travel times are estimated, additional origin and terminal times of 4 minutes are added to the skim matrix.

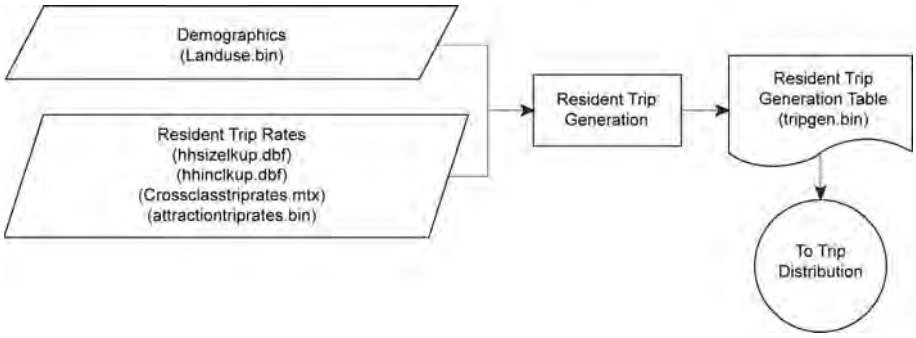
The highway skims proceed in the following manner:

1. The highway database and network are opened and nodes that are centroids are selected.
2. A travel time matrix from centroid to centroid is calculated using the peak and offpeak skims.
3. Intrazonal times taking into account nearest adjacent neighbor times are calculated.
4. Origin and terminal times are added to the matrix.

Descriptions of the input and output files and parameters can be found in Appendix A.

4. TRIP GENERATION

Resident Model Set



Overview

The resident trip generation models that were recently estimated and calibrated for the Clark County area were used as the starting point for the trip generation and calibration. The trip production models are cross-classification models stratified by income group and household size. In effect, the models provide trip production rates by trip purpose for each household size, income group stratum. The independent variable used is the number of households in the stratum. Five household size strata are used:

- 1 person households
- 2 person households
- 3 person households
- 4 person households
- 5 or more person households

The travel model uses four household income groups, consistent with the 2000 U.S. Census income categories. All incomes are represented in 1999 dollars:

- Low income (Less than $19,999)
- Lower-middle income ($20,000 to $29,999)
- Upper-middle income ($30,000 to $49,999)
- High income ($49,999 or more)

It is necessary to estimate a joint distribution of households by income group and household size (*i.e.*, 20 separate cells) for each TAZ. Submodels (documented below) are provided to produce these data from normal socioeconomic information forecast for each TAZ: population in households, number of households, and median income. As income increases, the rate of auto ownership and trip generation increases.

The trip attraction models are cross-classification-like models with number of employees by employment by type and households being the explanatory variables. The employment and household data are normally forecast by TAZ.

The resident trip generation models have been developed for the following trip purposes:

- Home-Based Work (HBWork)

- Home-Based School (HBSchool)
- Home-Based Shop (HBShop)
- Home-Based Other (HBOther)
- Non-Home-Based (NHB)

All trip rates documented herein are based on total person trips made in motorized vehicles. Person trips made using non-motorized modes such as walk, wheelchair, or bicycle and person trips made using unspecified modes were not included in the data used to estimate the trip rates.

Socioeconomic Submodels

Socioeconomic submodels were developed from 2000 Census data to estimate the number of households by income group and household size for each TAZ. Three submodels were developed:

- A submodel to estimate the number of households by household size based on the average household size of the TAZ and the number of households in the TAZ.
- A submodel to estimate the number of households by income group based on the ratio of the median income for the TAZ to the regional median income and the number of households in the TAZ.
- A submodel to estimate the joint distribution of households by income group and household size based on the results from the above two submodels.

2005 Base Year Data

The 2005 base year data for Douglas County and Carson City were estimated based on Year 2000 Census information. Table 4-1 shows the summary of the household information. The information for persons per household and number of households in certain income ranges was extracted from the dataset, which contained 64 block groups. The block group data have been used to estimate household size and income group submodels for use in the trip generation modeling process. The regional median income is based on the 2000 U.S. Census information for both Douglas County and Carson City. This data reveals that one-half of the households have an income less than $44,448 and the other half of the households have an income above this figure. The household population includes everybody living in the household regardless of their age. Table 4-1 has been revised to clarify the total households in both subsets.

Table 4-1: Douglas County and Carson City—2005 Data Summary

Category	Units
Population	109,964
1 person households	9,010
2 person households	14,055
3 person households	5,700
4 person households	4,746
5+ person households	3,154
Total occupied households	**36,665**
Households with income less than $19,999	6,472
Households with income between $20,000 and $29,999	4,374
Households with income between $30,000 and $49,999	8,893
Households with income greater than $49,999	16,926
Total occupied households	**36,665**
Regional median income	$44,488

The Households Size Disaggregation and Household Income Disaggregation Submodels were borrowed from the 2004 Las Vegas RTC Travel Demand Model recently developed by Parsons for the Las Vegas metropolitan area. This model also used data from the existing Carson City model. The joint distributions of households by household size and household income was, however, calibrated to the 2000 Census information for the counties of Douglas and Carson City.

Households by Household Size Disaggregation Submodel

The hypothesis underlying the household size disaggregation model is that for any given zonal average household size (*i.e.*, persons per household) there is a specific "mix" of households for each integer household size (*i.e.*, one person households, two person households, etc.). In order to implement this hypothesis as a functional model, household data from the 2000 Census were summarized and grouped by average household size. This summarization was performed at the census block group level with data grouped by ranges of 0.1 persons per dwelling unit (for example, 1.0 to 1.04 were grouped to the 1.0 range, 1.05 to 1.14 were grouped to 1.1, 1.15 to 1.24 were grouped to 1.2, etc.). The summarized data showed a reasonable relationship between average household size and the distribution of the integer persons per household when they were plotted.

A preliminary model was developed by "hand-fitting" curves to the census data. These non-linear, hand-fitted curves were not an adequate model since the percent of integer households did not necessarily meet two essential criteria. These two criteria were:

- The sum of the integer household percents equal 100.0 for each average household size
- The average persons per household calculated from the integer household percents equal the average household size being used as the independent variable.

Each average household size range was investigated to ascertain the change required in the integer household size percents to meet the above two criteria. The curves were then redrawn and smoothed to produce a usable household size disaggregation model. The final model is shown in Figure 4-1 and Table 4-2.

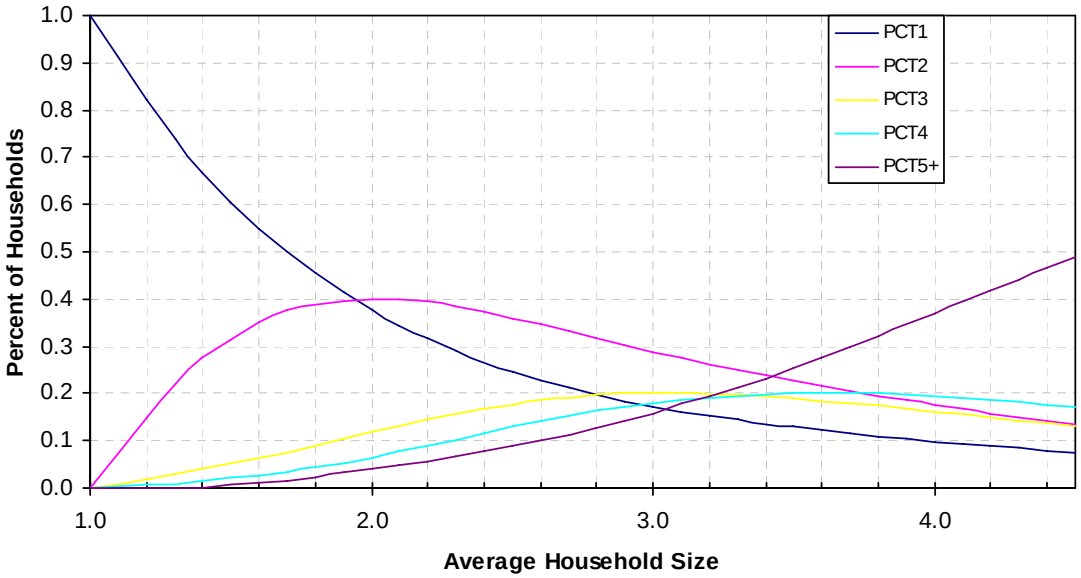


Figure 4-1: Household Size Disaggregation Submodel

Table 4-2: Household Size Disaggregation Submodel

Input Average Household Size	Proportion of Households by Size					Sum	Implied Average Household Size[1]
	1 Person	2 Person	3 Person	4 Person	5+ Person		
1.0	1.000	0.000	0.000	0.000	0.000	1.000	1.000
1.1	0.906	0.082	0.001	0.002	0.008	1.000	1.128
1.2	0.820	0.159	0.003	0.004	0.014	1.000	1.241
1.3	0.742	0.222	0.006	0.013	0.016	1.000	1.349
1.4	0.672	0.274	0.022	0.016	0.016	1.000	1.441
1.5	0.608	0.315	0.038	0.018	0.021	1.000	1.541
1.6	0.551	0.347	0.055	0.019	0.030	1.000	1.648
1.7	0.499	0.370	0.070	0.025	0.035	1.000	1.749
1.8	0.453	0.386	0.086	0.036	0.040	1.000	1.847
1.9	0.412	0.395	0.100	0.047	0.045	1.000	1.946
2.0	0.375	0.399	0.114	0.059	0.052	1.000	2.045
2.1	0.343	0.398	0.127	0.072	0.060	1.000	2.144
2.2	0.314	0.393	0.139	0.085	0.069	1.000	2.244
2.3	0.288	0.385	0.150	0.098	0.079	1.000	2.343
2.4	0.265	0.375	0.159	0.110	0.091	1.000	2.441
2.5	0.245	0.362	0.167	0.123	0.103	1.000	2.539
2.6	0.227	0.348	0.174	0.135	0.116	1.000	2.635
2.7	0.211	0.333	0.179	0.146	0.130	1.000	2.730
2.8	0.197	0.318	0.183	0.157	0.146	1.000	2.824
2.9	0.184	0.302	0.185	0.167	0.162	1.000	2.917
3.0	0.173	0.286	0.186	0.176	0.179	1.000	3.009
3.1	0.163	0.271	0.186	0.184	0.197	1.000	3.099
3.2	0.153	0.257	0.184	0.190	0.216	1.000	3.188
3.3	0.145	0.243	0.181	0.195	0.236	1.000	3.277
3.4	0.137	0.230	0.177	0.199	0.257	1.000	3.365
3.5	0.129	0.218	0.172	0.201	0.280	1.000	3.508
3.6	0.122	0.207	0.165	0.201	0.304	1.000	3.600
3.7	0.116	0.197	0.159	0.200	0.329	1.000	3.693
3.8	0.110	0.187	0.151	0.196	0.356	1.000	3.786
3.9	0.104	0.178	0.143	0.191	0.384	1.000	3.881
4.0	0.098	0.169	0.135	0.211	0.387	1.000	4.005
4.1	0.093	0.160	0.127	0.200	0.420	1.000	4.114
4.2	0.088	0.150	0.119	0.187	0.455	1.000	4.226
4.3	0.084	0.140	0.112	0.171	0.494	1.000	4.343
4.4	0.081	0.128	0.105	0.165	0.521	1.000	4.439
4.5	0.078	0.114	0.100	0.153	0.555	1.000	4.549

[1] Average household sizes for five or more person households used to estimate the implied average household size:

Input Household Size Range	Average 5+ Household Size
1.00 – 3.49	5.6
3.50 – 3.50	5.8
4.00 or more	6.0

Households by Income Group Disaggregation Model

The income group disaggregation model is similar in form to the household size disaggregation model. The independent variable for the model is the ratio of the TAZ median income to the regional median income. The model was estimated using block level data from the 2000 Census. The income ranges defined by the Census for the block group data that was used for the income group disaggregation model are shown in the Table 4-3. The regional median income in 1999 dollars and median incomes for each of the block groups were also obtained from the block group data.

Table 4-3: Household Income Classification

Income Group	2000 Census Income Range Used (1999 Dollars)	Households in Range (2000 Census)	
		Number	Percent
Low	Less than $19,999	6,472	17.6%
Lower-middle	$20,000–$29,999	4,374	11.9%
Upper-middle	$30,000–$49,999	8,893	24.3%
High	$50,000 or more	16,926	46.2%

For future forecasts, median incomes can be left unchanged in stable TAZs. For TAZs that are developed or redeveloped between the base and forecast years, TAZ median incomes can be estimated from similar TAZs. Future year income forecasts can be in 1999 or future year dollars. The effect of changing the base year for income forecasts will be accounted for by using the ratio of the TAZ median income to the regional median income. In effect, the income group disaggregation model is "self-correcting" for changes in real or inflationary income.

The ratios of the TAZ median incomes to the regional median income and the proportions of households in each of the four income groups were calculated for each block group. Four curves were then developed for the income group disaggregation submodel to represent the proportions of households within the income ranges for each value of the income ratio. The proportions defining the curves were constrained to sum to 1.0 for each value of the income ratio. In addition, the curves were defined such that the implied TAZ median income would fall in the income group implied by the input income ratio. For example, if the input TAZ median income is $31,200, the TAZ to regional median income ratio is 0.7. The income group disaggregation model, a total of 48.1 percent of the households would have incomes in the low and lower-middle income group ranges. The lowest 5.96 percent of the 31.9 percent of the households in the upper-middle income range (*i.e.*, 1.9 percent of all households in the region) would also have incomes less than $31,200. If incomes in the upper-middle income range are assumed to be uniformly distributed (an unlikely case), the implied median income for the TAZ would be 5.96 percent of the range from $30,000–$49,999, or $31,192. Table 4-4 and Figure 4-2 show the income group disaggregation model.

Table 4-4: Income Group Disaggregation Submodel

Input Income Ratio	Proportion of Households by Income Group				Total	Implied Median Income	Implied Income Ratio
	Low Income	Lower-Middle Income	Upper-Middle Income	High Income			
0.10	1.000	0.000	0.000	0.000	1.000	10,000	0.22
0.20	1.000	0.000	0.000	0.000	1.000	10,000	0.22
0.30	0.725	0.155	0.090	0.030	1.000	13,792	0.31
0.40	0.550	0.230	0.162	0.058	1.000	18,181	0.41
0.50	0.430	0.247	0.225	0.098	1.000	22,834	0.51
0.60	0.349	0.230	0.280	0.141	1.000	26,572	0.60
0.70	0.281	0.200	0.319	0.200	1.000	31,168	0.70
0.80	0.230	0.173	0.336	0.261	1.000	35,774	0.80
0.90	0.192	0.150	0.339	0.319	1.000	39,321	0.88
1.00	0.165	0.132	0.319	0.384	1.000	42,727	0.96
1.10	0.140	0.116	0.287	0.457	1.000	47,003	1.05
1.20	0.119	0.104	0.260	0.517	1.000	n/a[1]	n/a[1]
1.30	0.100	0.092	0.240	0.568	1.000	n/a[1]	n/a[1]
1.40	0.085	0.082	0.220	0.613	1.000	n/a[1]	n/a[1]
1.50	0.070	0.070	0.200	0.660	1.000	n/a[1]	n/a[1]
1.60	0.060	0.060	0.181	0.699	1.000	n/a[1]	n/a[1]
1.70	0.050	0.051	0.163	0.736	1.000	n/a[1]	n/a[1]
1.80	0.045	0.043	0.146	0.766	1.000	n/a[1]	n/a[1]
1.90	0.040	0.037	0.132	0.791	1.000	n/a[1]	n/a[1]
2.00	0.036	0.031	0.116	0.817	1.000	n/a[1]	n/a[1]
2.10	0.032	0.025	0.103	0.840	1.000	n/a[1]	n/a[1]
2.20	0.027	0.020	0.088	0.865	1.000	n/a[1]	n/a[1]
2.30	0.024	0.017	0.080	0.879	1.000	n/a[1]	n/a[1]
2.40	0.021	0.013	0.070	0.896	1.000	n/a[1]	n/a[1]
2.50	0.018	0.011	0.060	0.911	1.000	n/a[1]	n/a[1]
2.60	0.016	0.009	0.050	0.925	1.000	n/a[1]	n/a[1]
2.70	0.014	0.007	0.041	0.938	1.000	n/a[1]	n/a[1]
2.80	0.012	0.005	0.033	0.950	1.000	n/a[1]	n/a[1]
2.90	0.010	0.004	0.027	0.959	1.000	n/a[1]	n/a[1]
3.00	0.008	0.003	0.021	0.968	1.000	n/a[1]	n/a[1]
3.10	0.007	0.002	0.018	0.973	1.000	n/a[1]	n/a[1]
3.20	0.007	0.002	0.013	0.979	1.000	n/a[1]	n/a[1]
3.30	0.006	0.001	0.010	0.983	1.000	n/a[1]	n/a[1]
3.40	0.006	0.001	0.007	0.987	1.000	n/a[1]	n/a[1]
3.50	0.005	0.001	0.004	0.990	1.000	n/a[1]	n/a[1]
3.60	0.005	0.000	0.002	0.994	1.000	n/a[1]	n/a[1]
3.70	0.004	0.000	0.001	0.995	1.000	n/a[1]	n/a[1]
3.80	0.004	0.000	0.001	0.996	1.000	n/a[1]	n/a[1]
3.90	0.003	0.000	0.000	0.997	1.000	n/a[1]	n/a[1]
4.00	0.003	0.000	0.000	0.998	1.000	n/a[1]	n/a[1]
4.10	0.002	0.000	0.000	0.998	1.000	n/a[1]	n/a[1]
4.20	0.002	0.000	0.000	0.999	1.000	n/a[1]	n/a[1]
4.30	0.001	0.000	0.000	0.999	1.000	n/a[1]	n/a[1]
4.40	0.000	0.000	0.000	1.000	1.000	n/a[1]	n/a[1]
4.50	0.000	0.000	0.000	1.000	1.000	n/a[1]	n/a[1]
4.60	0.000	0.000	0.000	1.000	1.000	n/a[1]	n/a[1]
4.70	0.000	0.000	0.000	1.000	1.000	n/a[1]	n/a[1]
4.80	0.000	0.000	0.000	1.000	1.000	n/a[1]	n/a[1]

[1] Since the median income falls in the high income group and the maximum income for that group is undefined, the implied median income cannot be estimated.

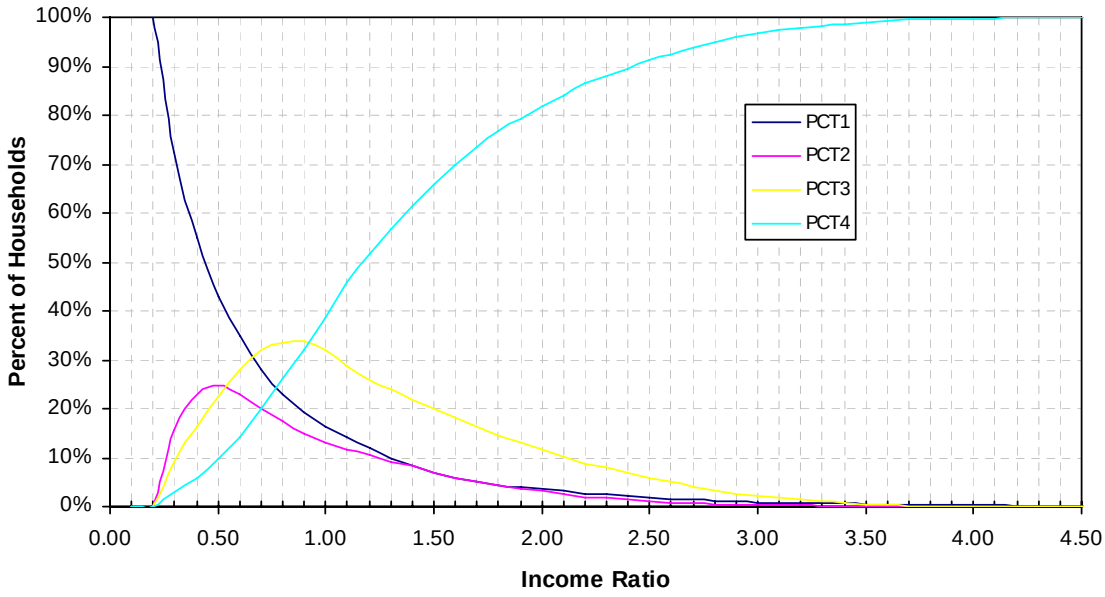


Figure 4-2: Income Group Disaggregation Submodel

Estimating Joint Distributions of Households by Socioeconomic Strata

The two submodels described in the previous sections result in *preliminary* estimates of the following "univariate," or "marginal," distributions of households for each TAZ:

- Households by household size
- Households by income group

The initial applications of the models result in preliminary estimates for the following reason. If the households are summed over the strata included in each univariate distribution for each TAZ, the total will be the number of households for the TAZ. For example, if the estimated households by household size are summed for TAZ 1, the total will be the number of households in TAZ 1.

To ensure that the regional sums match, a marginal weighting, or fratar, process can be applied on a regional basis. For this application, the input "matrices" are the estimates of households for each TAZ in the region from the preliminary applications of the household size or income group disaggregation submodels. The marginal distributions for this application of the marginal weighting process are the total numbers of households for each TAZ and the estimated regional households for the socioeconomic stratum being factored—regional households by household size or regional households by income group. The results of this marginal weighting step will ensure that the total numbers of households for each TAZ are correct when the various socioeconomic distributions are summed by TAZ, and that the regional households by socioeconomic stratum are correct when the households for the stratum are summed across all TAZs. Regional distributions of households by income group *and* household size are used to develop the regional control totals for households.

A third submodel completes the disaggregation and results in estimates of households jointly stratified by income group and household size for each TAZ. The submodel uses the results from the modified marginal distributions of households by income group and households by household size for each TAZ along with the regional joint distribution of households by income group and

household size (Tables 4-5 and 4-6). The final joint distributions are shown in Tables 4-5 and 4-6 and were developed by updating the joint distributions that was developed for Clark County. The Clark County joint distribution is based on the Public Use Micro Sample (PUMS) data from the 2000 Census, which is a one percent sample of all households for a given county. The Clark County estimates for the joint distribution was then fratared to match the marginals that were obtained for the 2000 Census for Douglas County and Carson City by household size and income group. The median income for each TAZ was derived from the 2000 Census block group data and is represented in 1999 dollars.

Table 4-5: Households by Income Group and Household Size

	Household Size					
Income Group	**1**	**2**	**3**	**4**	**5+**	**Total**
Low	3,689	1,481	640	391	270	6,472
Low-middle	1,483	1,756	523	389	224	4,374
Upper-middle	2,269	2,654	1,393	986	681	8,893
High	1,569	7,163	3,234	2,981	1,979	16,926
Total	9,010	14,055	5,700	4,746	3,154	36,665

Table 4-6: Proportion of Households by Income Group and Household Size

	Household Size					
Income Group	**1**	**2**	**3**	**4**	**5+**	**Total**
Low	10.1%	4.0%	1.7%	1.1%	0.7%	17.7%
Low-middle	4.0%	4.8%	1.4%	1.1%	0.6%	11.9%
Upper-middle	6.2%	10.0%	3.6%	2.7%	1.9%	24.3%
High	4.3%	19.5%	8.8%	8.1%	5.4%	46.2%
Total	24.6%	38.3%	15.5%	12.9%	8.6%	100.0%

The third submodel effectively fratars the regional joint distribution of households by income group and household size on a TAZ-by-TAZ basis to match the modified marginal distributions of households by income group and households by household size for each TAZ. All three submodels have been coded in TransCAD GISDK scripts for automatic application each time the trip generation module is invoked.

Socioeconomic Model Application Summary

In summary, the process for estimating the number of households for the joint distribution of households by income group and household size for each TAZ makes extensive use of the marginal weighting technique. The process is as follows:

- Preliminary estimates of the number of households by income group and households by household size are developed for each TAZ using the appropriate socioeconomic disaggregation submodel.

- The preliminary estimates of households for each marginal socioeconomic distribution for each TAZ are marginally weighted so that the numbers of households for each TAZ and the total numbers of households for each socioeconomic group for the region are matched.
- The regional distribution of households by income group and household size are marginally weighted to match the estimated marginal distributions of households by income group and household size on a TAZ-by-TAZ basis.

All three submodels have been coded in TransCAD GISDK scripts for automatic application each time the trip generation module is invoked.

Trip Production Models

Trip production models were borrowed from the Las Vegas region and were estimated using a traditional cross-classification analysis. Purpose specific person trips made in motorized vehicles were summarized for each household and average trip rates per household were then calculated for all households within defined socioeconomic strata. As outlined in the socioeconomic data section above, two household characteristics, household size and income group, were used to define the household strata. As income becomes greater, the rate of auto ownership and trip generation generally increases. However, larger household size causes a greater increase in trip generation rates than rising income levels. These submodels were further refined to better represent Douglas and Carson City.

Home-Based Work Trip Production Model

Table 4-8 shows the Home-Based Work trip production model for the region. Based on strict statistical comparisons of trip rates, some combining of cells could have been performed. However, the increase in trip rates as household size increased and as income group increased was very reasonable.

Table 4-8: Home-Based Work Trip Production Model

	Household Size				
Income Group	**1**	**2**	**3**	**4**	**5+**
Low	0.34	0.71	0.76	1.67	2.00
Lower-middle	0.65	1.07	1.46	1.79	2.27
Upper-middle	0.88	1.37	1.96	2.13	2.40
High	0.95	1.89	2.26	2.39	2.64

Home-Based School Trip Production Model

Table 4-9 shows the HBSchool trip production model for the region. Shading of cells shows the trip rate combinations performed as part of the model estimation. The HBSchool trip production model shown in Table 4-9 is for trips made in motorized vehicles to all:

- Pre-schools and kindergartens
- Elementary schools, middle schools, and high schools
- Community colleges and vocational/technical schools.

Table 4-9: Home-Based School Trip Production Model

Income Group	Household Size				
	1	2	3	4	5+
Low	0.01	0.27	0.48	0.95	3.11
Lower-middle	0.01	0.02	0.48	0.95	3.11
Upper-middle	0.01	0.02	0.48	1.77	3.11
High	0.01	0.14	0.48	1.77	3.11

The trip rates shown in Table 4-9 tend to vary more by household size than by income group. This is logical since HBSchool trips are primarily dependent on the presence of school-age children in a household, which should be highly correlated with household size. The very low rate for one-person households reflects a small number of single person households where the householder is a student. The difference between trip rates for low and lower-middle income, two person households probably reflects the impact of single-parent households. Specifically, low income, two-person households are probably more likely to be "single parent with a child" households, while two (working) adults are more likely to comprise two-person, lower-middle and upper-middle income households.

The HBSchool trip production model shown in Table 4-9 has sensitivity to household structure. In other words, since the model is stratified by household size, it is sensitive to changes in household size—the increase or decrease in number of children in a household. Nevertheless, the total HBSchool productions should be compared to the total attractions based on enrollment projections. If a large imbalance is noted, an inconsistency between forecast population and households, and forecast school enrollment is possible.

Since only person trips made in motorized vehicles have been summarized in the trip rates shown in Table 4-9, behavior regarding the propensity to walk or bicycle to school is assumed to remain constant over time. This assumption is consistent with the assumption made when HBSchool trip attractions are forecast based on school enrollment.

Home-Based Shop Trip Production Model

Table 4-10 shows the HBShop trip production model for the region. Shading of cells shows the trip rate combinations performed as part of the model estimation. Again, the trip rates tend to vary by household size, but not income group, and for this purpose, the variation in trip rates across two-, three-, and four-person households was not significant. The lack of variation across income groups is generally logical. Households need to shop for basic necessities regardless of income. Income is a primary determinant of whether shopping takes place at a high-end retail store or a discount store.

Table 4-10: Home-Based Shop Trip Production Model

Income Group	Household Size				
	1	2	3	4	5+
Low	0.36	092	0.92	0.92	1.59
Lower-middle	0.54	0.92	0.92	0.92	1.59
Upper-middle	0.54	0.92	0.92	0.92	1.59
High	0.54	0.92	0.92	0.92	1.59

The lack of variation across household size is also reasonable. The two-person household rate is about twice the one-person household trip rate, reflecting an increased tendency for both household members to shop together. However, for three- and four-person households, no significant increase in the trip rate was observed. This reflects the fact that, quite often, not all household members are required for the "shopping trip." In a three- or four-person household, this would indicate the tendency for only one extra household member to participate in the shopping trip.

Home-Based Other Trip Production Model

Table 4-11 shows the HBOther trip production model for the region. Shading of cells shows the trip rate combinations performed as part of the model estimation. The variation in trip rates across household sizes is reasonable. In addition, some variation in trip rates across income groups might reflect the influence of additional disposable income, allowing for additional trips to be made (see also the NHB trip rates).

Table 4-11: Home-Based Other Trip Production Model

	Household Size				
Income Group	**1**	**2**	**3**	**4**	**5+**
Low	1.46	2.68	3.63	5.83	6.54
Lower-middle	1.46	2.68	3.63	5.83	6.54
Upper-middle	1.46	2.68	3.63	5.83	6.54
High	1.46	2.68	4.76	5.83	10.44

Non-Home-Based Trip Production Model

Table 4-12 shows the NHB trip production model for the region. Shading of cells shows the trip rate combinations performed as part of the model estimation. The variation in trip rates across household sizes is reasonable. In addition, the variation in trip rates across income groups probably reflects the influence of additional disposable income allowing for additional trips to be made (see also the HBOther trip rates).

The NHB trip production model is applied only to obtain a regional control total for NHB trips. The locations of the actual trip productions are determined using an allocation model. For the Douglas County and Carson City region, the NHB trip attraction model is used as the allocation model (in effect, NHB productions are set equal to NHB attractions on a TAZ-by-TAZ basis after the NHB attractions are scaled to match the regional total NHB productions).

Table 4-12: Non-Home-Based Trip Production Model

	Household Size				
Income Group	**1**	**2**	**3**	**4**	**5+**
Low	0.85	1.43	2.36	2.96	2.96
Lower-middle	1.70	1.43	2.36	2.96	2.96
Upper-middle	1.70	2.51	2.36	4.93	4.93
High	2.39	2.51	3.25	4.93	4.93

Trip Attraction Models

The trip attraction models were borrowed from the Las Vegas region and were estimated using an "aggregate" cross-classification analysis coupled with some guiding principles. The aggregate cross-classification technique was implemented by aggregating expanded trip attractions by the type of land use at the attraction end of the trip. Thus, if a person traveled from home to a store to shop and then traveled back home again, two HBShop attractions were shown at a retail land use.

Once total attractions by land use have been aggregated by land use, they are divided by the total employment (or households in the case of residential land uses) associated with the land use. Table 4-13 shows the land use types along with the associated type of employment or households used as the independent variable. While it is not possible to estimate any calibration statistics using this procedure, it has proved very successful in producing reasonable trip attraction models in other regions. It is not affected by the high correlation between the explanatory variables (e.g., employment by type) that typically plagues trip attraction models estimated using district-based linear regression techniques.

Table 4-13: Land Use Types and Explanatory Variables for Trip Attraction Rates

Land Use Type	Explanatory Variable
Residential	Households
Basic industries including forestry, fishing, mining, manufacturing, public utilities, warehousing	Industrial employment
Retail	Retail employment
Recreational and personal services including theaters, schools, government, convention centers, daycare, sports facilities and gyms	Office and other non-classified employment
Churches and other religious facilities	
Medical facilities	
Banks	
Personal and business services including financial, insurance, and real estate, consultants, attorneys, accountants	
Casinos and hotels	Casino and hotel employment
Unknown	
Parks and open spaces	None

One guiding principle used in the estimation of trip attraction rates was that the explanatory variables had to be logical attractors of trips for the purpose being modeled. Thus, all home-based school trip attractions were assumed to occur at schools with the explanatory variable being school enrollment. Likewise, all home-based shop trip attractions were assumed to be made to retail establishments with retail employment being the explanatory variable.

Table 4-14 summarizes the trip attraction models. All rates shown in Table 4-14 are for person trips made in motorized vehicles. The following sections provide brief discussions of the trip attraction models.

Table 4-14: Trip Attraction Models

		Regular Trip Attraction Rate per								
		Employment					School Enrollment			
Trip Purpose	Trip Attraction Rate per Household	Industrial	Office and Non-Classified	Retail	Casino–Hotel	Total	Grades 1–8	Grades 9–12	Grades 13+	Special generators - Casino
HBWork	0.02					0.99				0.99
HBSchool							0.99	1.88	0.46	
HBShop				2.37						
HBOther	0.38	0.60	2.46	2.07	0.95					1.97
Non-HB	0.20	1.08	1.08	3.36	0.48					0.51

Home-Based Work Trip Attraction Model

There are two items of note in the HBWork trip attraction model. First, there is a low HBWork trip attraction rate per household. While it might have been possible to specify that HBWork trips would be attracted only to establishments with employment, the low attraction rate per household is similar to that found in a number of other cities. The rate probably accounts for domestic help and service calls (e.g., insurance agents, plumbers, and large appliance repair personnel) made directly from the employee's home to a residential worksite.

The HBWork trip productions will be output by income group in an effort to improve trip distribution modeling, and when a mode choice model is added to the modeling process, mode choice. Since the HBWork trip attraction model has not been stratified by income group, the total HBWork attractions will be scaled to match total productions for each of the four income groups in question. Such a procedure results in a trip attraction model that "assumes" that the same proportions of trip attractions by income group hold constant across all TAZs in the region. While such an assumption produces a gross regional average, the procedure and results are still quite effective in improving trip distribution and mode choice.

Home-Based School Trip Attraction Model

The HBSchool trip attraction rates vary by age of the student making the trip. The rate for elementary school-aged students (grades 1–8) is substantially lower than the rate for high school students. These rates probably reflect a higher likelihood for elementary school students to attend neighborhood schools within walking distance of the home and a higher likelihood for high school students to live farther from their schools as well as high school students' capabilities of driving themselves to school.

The low HBSchool trip attraction rate per enrollee in grades 13 and higher probably reflects the "part-time" nature of those trips. Specifically, many students in post-high school educational institutions either attend part-time or establish their schedules so that they do not attend classes every school day.

Home-Based Shop Trip Attraction Model

The HBShop trip attraction model was based on the assumption that all shop trips are attracted by retail employees. Based on the summary of the household survey data, numerous shop trips were made to non-retail land uses. Undoubtedly, this happened in some cases—a trip for shopping purposes might have been made to a retail establishment at a casino (listing the casino as the destination), a person could have stopped at a beauty salon to purchase hair care products, or a could have stopped at someone's home to pick up goods from an in-home business. In some cases (e.g., the shopping trips to the beauty salon or the home), shopping trips are truly made to land uses with no retail employees. However, these unadjusted HBShop rates for non-retail were very small (0.01 trips per employee). Thus, the assumption that all HBShop trips are attracted by retail employment is reasonable.

The HBShop rate per full-time equivalent retail employee might seem low—2.37 HBShop trip attractions per retail employee suggests that each retail employee serves only about 1.15 people per day. However, if HBShop, HBOther, and NHB trips per retail employee are summed, the overall attraction rate per retail employee is 11.16 (NHB must be counted twice due to the method used to model NHB trips), or about 5.6 people per day.

Home-Based Other Trip Attraction Model

The HBOther trip attraction model includes rates for all types of employment and for households. The travel demand model attracts 0.38 HBOther person trips per household. In essence, this suggests that, on the average, about one out of every five homes has a visitor during the day. Thus, the travel demand model focuses HBOther attractions more toward employment areas than toward residential areas.

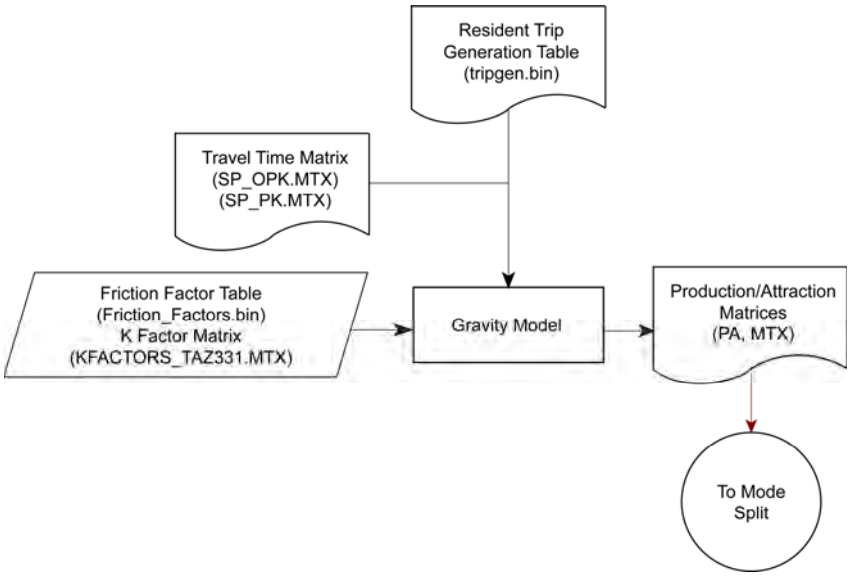
Non-Home-Based Trip Attraction Model

Like the HBOther trip attraction model, the NHB trip attraction model includes rates for all types of employment and for households. Continuing the example of trips attracted per household, the travel demand model attracts 0.2 NHB trips per day. Since NHB productions are set equal to NHB attractions on a TAZ-by-TAZ basis after balancing to the regional control total for NHB trips estimated using the household-based trip production model, each home attracts an average of 0.2 visitors per day. Combined with the HBOther rates, the travel demand model suggests that each home has 0.4 visitors per day, or in other words, every 2.5 homes has a visitor each day.

Special Generator Trip Attraction Models

The trip attraction model includes unique trip attraction rates for casinos and is considered as "special generator" with the ability to have unique trip attraction rates per employee. The special generator models simply affect the total trip attractions to these locations. It must be noted however that the special generators are not currently being used but are provided as part of the model development and can be used without any changes to the model structure.

5. TRIP DISTRIBUTION



Introduction

Trip distribution assigns the trips calculated during trip generation to the appropriate production and attraction TAZ pairs. The trips to each TAZ pair are determined based on the gravity model.

$$T_{ij} = P_i \times \left[\frac{K_{ij} \times F_{ij} \times A_j}{\sum_{k=1}^{n} \left(K_{ik} \times F_{ik} \times A_k \right)} \right]$$

where:

T_{ij} = trips between zone i and zone j
P_i = productions in zone i
A_j = attractions in zone j
K_{ij} = K-factor adjustment between zone i and zone j
F_{ij} = friction factor between zone i and zone j
i = production zone
j = attraction zone
n = total number of zones

The calibration process calculates the friction factors and K-factors used in the above equation. The goal in calibrating trip distribution is to arrive at friction factors and K-factors such that the average trip lengths and trip length frequency distributions resulting for each trip purpose are similar to those from survey data.

Gamma Function

The friction factors used in the Douglas County/Carson City Travel Demand Model are based on a gamma function. This type of function has three parameters—alpha (a), beta (b), and gamma (c)—as shown in the following equation.

$$F_{ij} = a \times t_{ij}^{b} \times e^{ct_{ij}}$$

where:

F_{ij} = friction factor between zone i and zone j
t_{ij} = travel time between zone i and zone j
a = alpha parameter
b = beta parameter
c = gamma parameter

This document adheres to the above equation in defining the three parameters. TransCAD, however, requires the values of beta and gamma to be of the opposite sign when defining the parameters. The values input into the TransCAD model script for beta and gamma are opposite the values listed in this document.

The gamma function is a smooth, monotonically decreasing function when both the beta and gamma parameters are negative. This suggests that travelers are sensitive to travel time as they travel to satisfy their needs. For example, a person is less likely to travel to a grocery store ten minutes from home if there is a store only five minutes from home.

If the calibrated beta parameter is positive, the function increases to an inflection point and then decreases as the travel time increases. In general, this should be avoided, since it implies that up to a certain point, travelers have a desire to travel further to satisfy their need for travel. In certain cases, a positive beta parameter can be justified.

If the calibrated gamma parameter is positive, the function decreases to a point and then increases. A positive gamma parameter can be used if the inflection point is greater than the highest travel time expected between any two points in the region. Alternatively, the function can be converted to a look-up table and modified to be equal to the minimum value at travel times greater than the inflection point.

Source of Data

The work trip length frequency distribution from the 2000 Census was obtained for Douglas County and Carson City. This observed data was used to compare the modeled trip length frequencies.

Calibration Process

The trip distribution calibration process included determining the parameters for the friction factors and calculating the K-factors if needed. K-factors are calculated to adjust for major distribution characteristics not explained by travel time. These differences may be caused by natural or manmade barriers, such as rivers or railroads, or by socioeconomic characteristics. The

first process was to determine the friction factor parameters. After the friction factors were finalized, it was found that there was no need to calculate K-factors. The K-factors procedures are provided as part of the model development process but were not used

Friction Factor Parameters

The following list explains the general process taken for each trip purpose to calculate the friction factors.

- Run the model with reasonable set of friction factor parameters obtained from another region.
- Compare histograms and average trip lengths of the results of the model run with the observed data.
- Based on the results of the comparisons, calculate the desired friction factors for a new model run that would more closely match the observed trip length frequency distribution.
- Use linear regression techniques (based on a log-transformation of the gamma function) to convert the desired friction factors into revised gamma function parameters for use in TransCAD.
- Run the model with the new gamma function parameters and continue with the comparisons and calculations of new gamma parameters until the results compare reasonably with the observed data.

Calibrated gamma function parameters for home-based work trips are shown in Table 5-1 and Figure 5-1 shows the gamma functions.

Table 5-1: Final Friction Factor Parameters—Home-Based Work

Parameter	HBW–Income 1	HBW–Income 2	HBW–Income 3	HBW–Income 4
Alpha	1,064,931	1,064,931	1,064,931	1,064,931
Beta	–0.452	–0.452	–0.452	–0.452
Gamma	–0.063	–0.063	–0.063	–0.063
Format	Function	Function	Function	Function

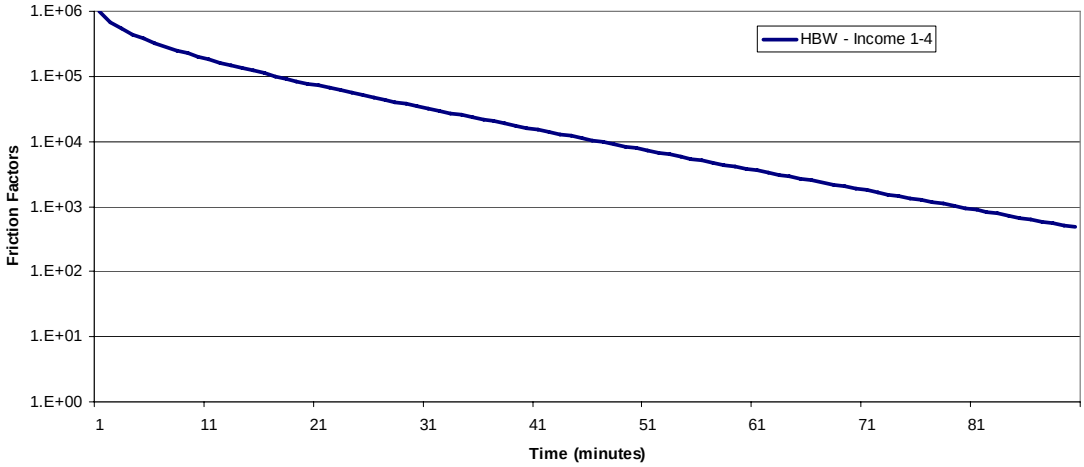


Figure 5-1: Friction Factor Parameters—Home-Based Work

Table 5-2 and Figure 5-2 show the friction factors for other resident trip purposes. The gamma parameter is positive for the home-based shop and home-based other trip purposes. The home-based shop gamma function begins increasing after about 80 minutes of travel time and the home-based other function begins increasing after about 60 minutes of travel time. For the non-home-based and home-based other trip purposes, the gamma function was converted to a tabular form for use in TransCAD. The friction factors for travel times greater than the times at the inflection points were modified to be equal to the minimum value of the gamma function.

Table 5-2: Final Friction Factor Parameters—Other Trip Purposes

Parameter	HBSchool	HBShop	HBOther	NHB
Alpha	1,136,464	1,185,375	1,072,144	967,402
Beta	–1.972	–1.639	–1.646	–2.824
Gamma	–0.128	–0.170	–0.070	0.033
Format	Function	Function	Table	Table

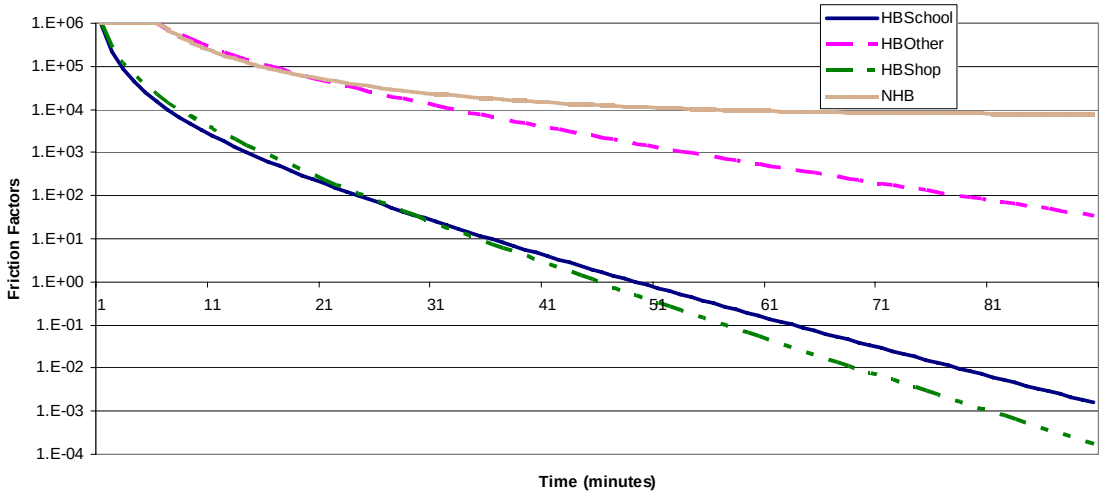


Figure 5-2: Friction Factor Parameters—Other Trip Purposes

Trip Length Frequency Distributions

The travel time comparison of Home based work trips with the 2000 Census information is shown in Figure 5-3. It can be seen that the observed and the modeled travel times are very similar. The trip length frequency distributions are based on trip duration (time) using 5 minute "bins" to categorize the data. Table 5-3 summarises the travel time results for all the Home-based work trip purposes

The trip length (distance) for Home Based work trip purposes is shown in Figure 5-4 and uses 0.25 mile bins to categorize the data.

In other words, the bin for 5 minutes represents all trips in the range 5.0 to 9.99 minutes; the bin for 0.25 mile includes all trips in the range 0.0 to 0.25 miles.

Although no information was available for other trip purposes from the 2000 census, the travel times and trip distances for these other trip purposes are within acceptable limits. Figures 5-5 to 5-8 and the Table 5-4 summarizes the results for the non work trip purposes.

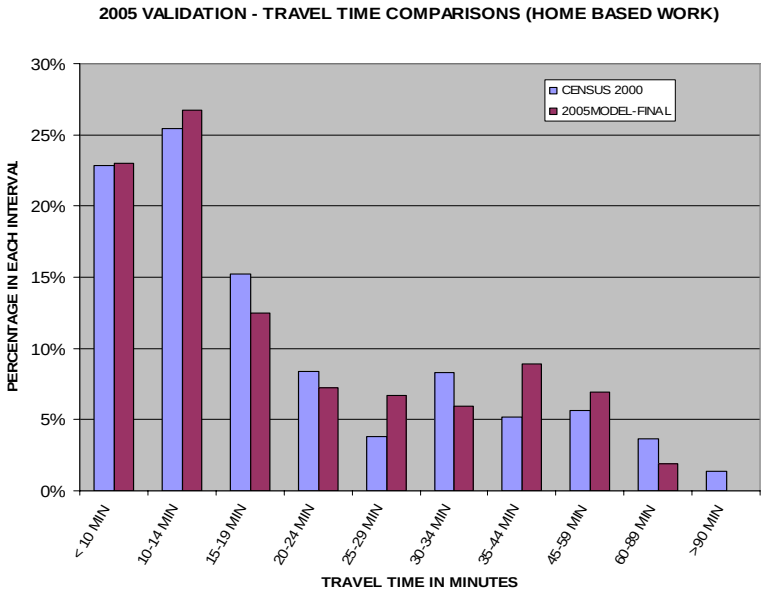


Figure 5-3: Travel Time Frequency Distributions—Home-Based Work Trips

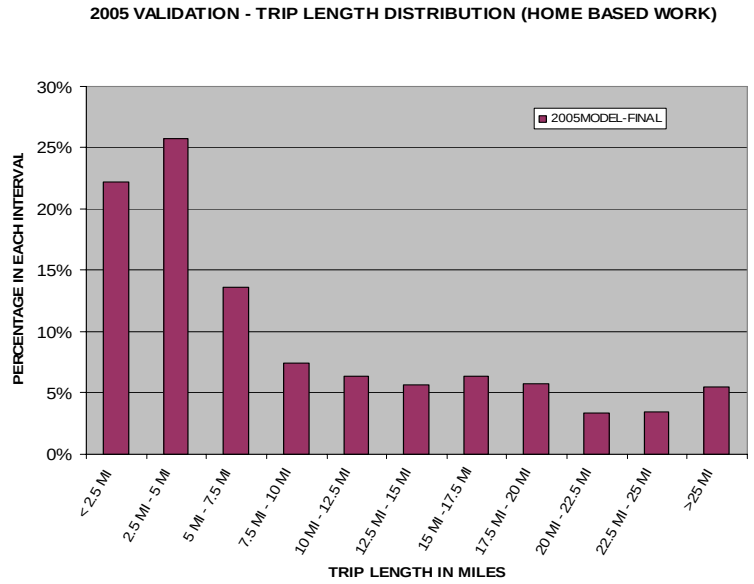


Figure 5-4: Trip Length Frequency Distributions—Home-Based Work Trips

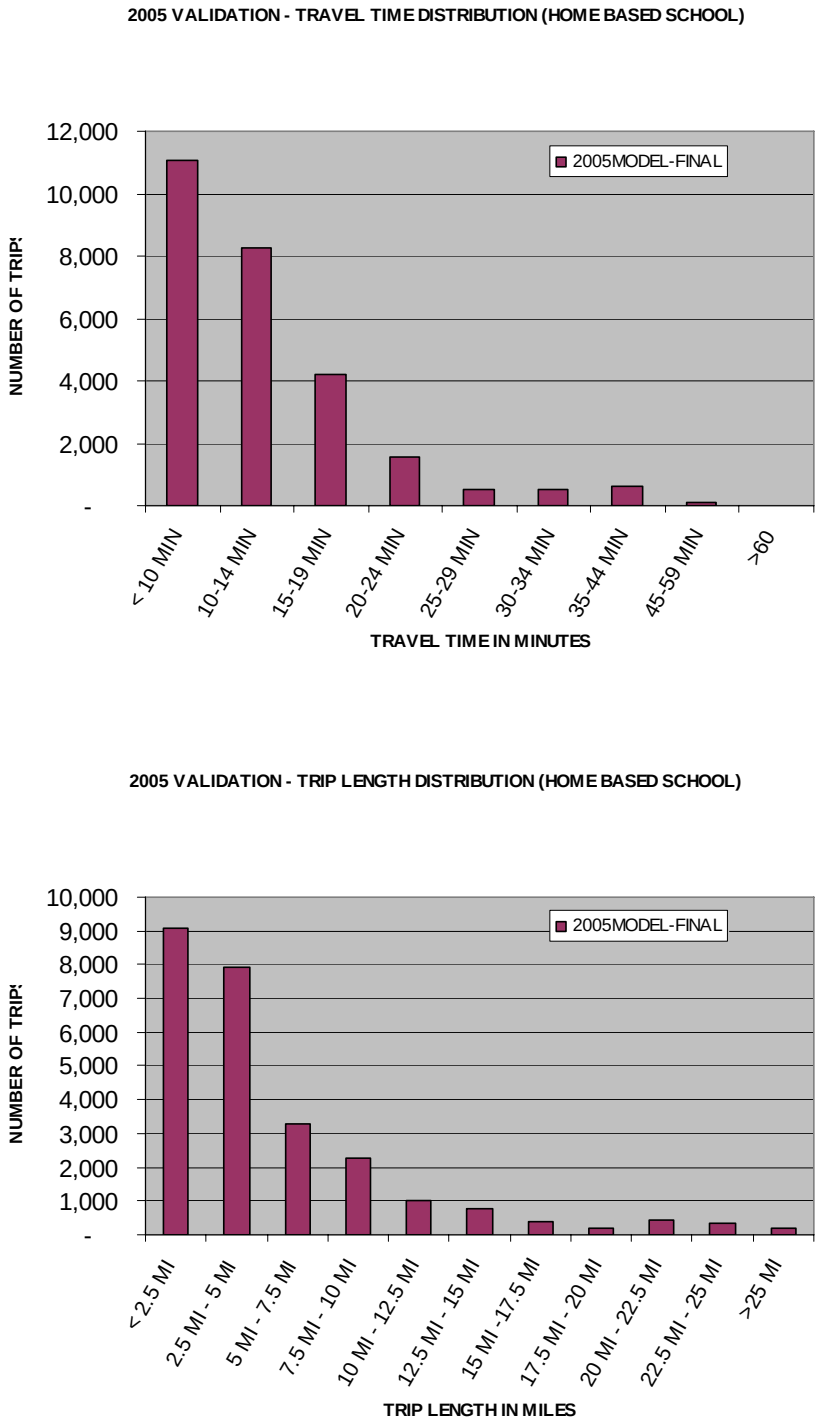


Figure 5-5: Home-Based School Trips – Frequency Distribution

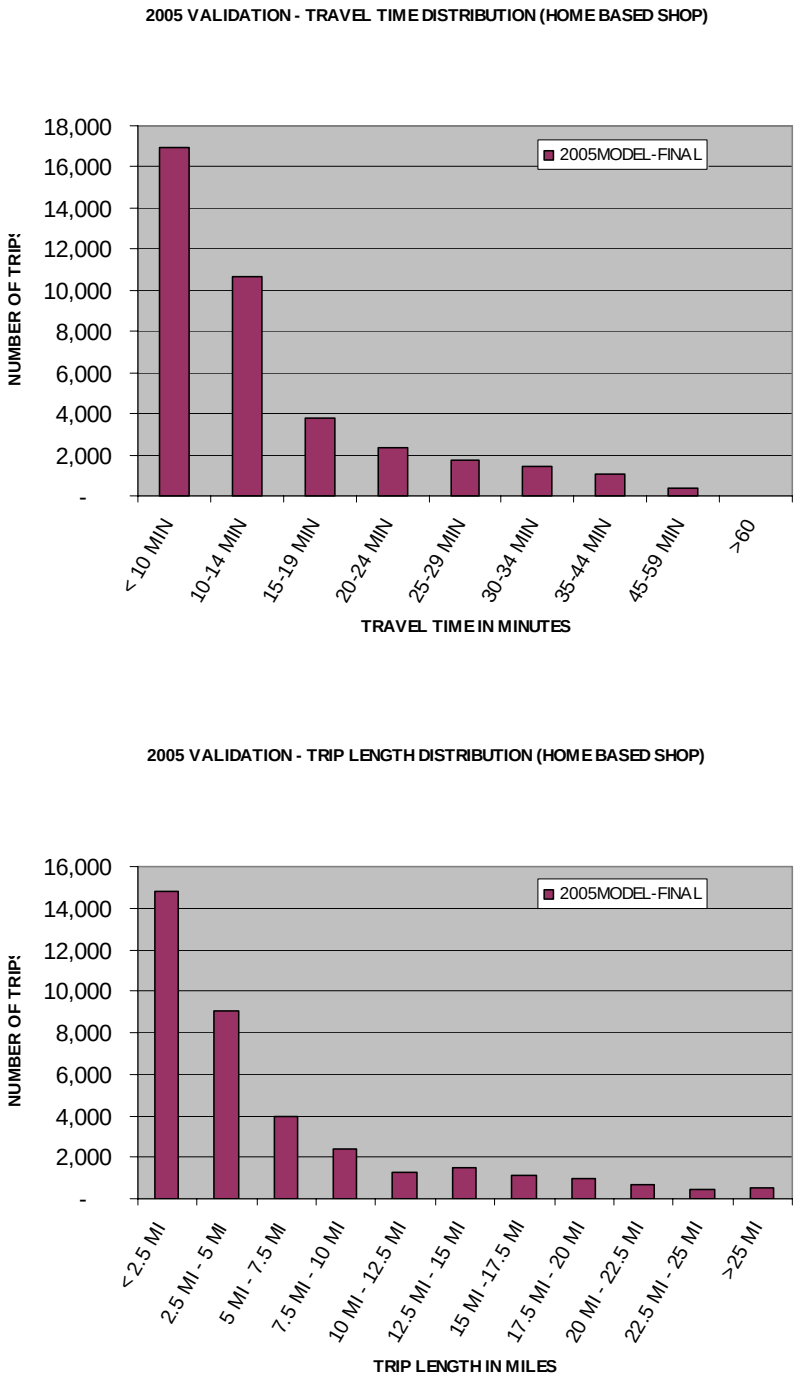
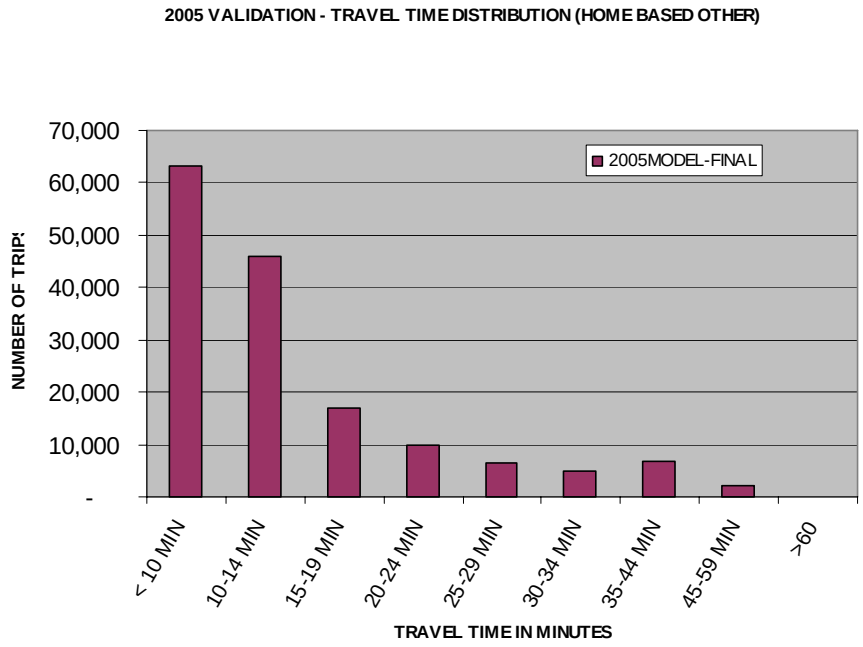


Figure 5-6: Home-Based Shop Trips – Frequency Distribution



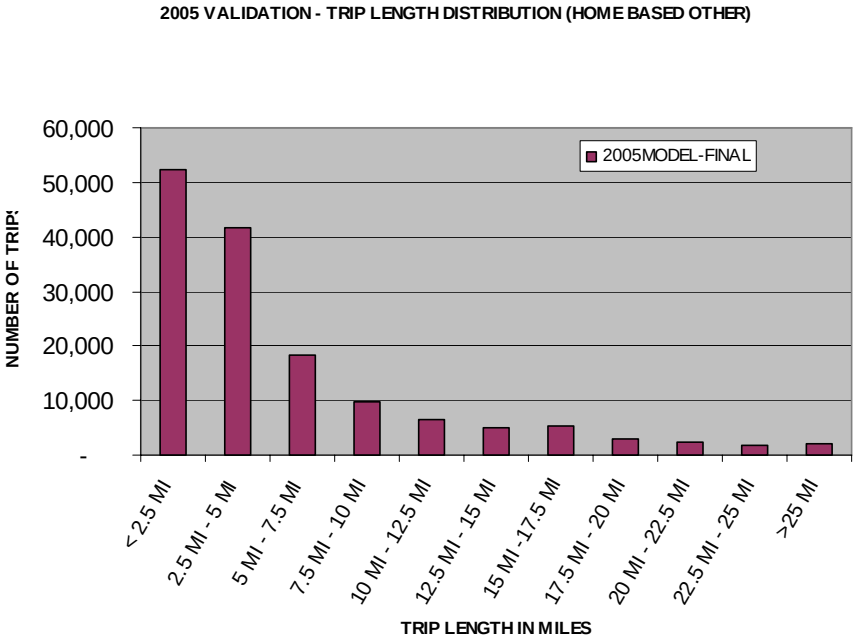
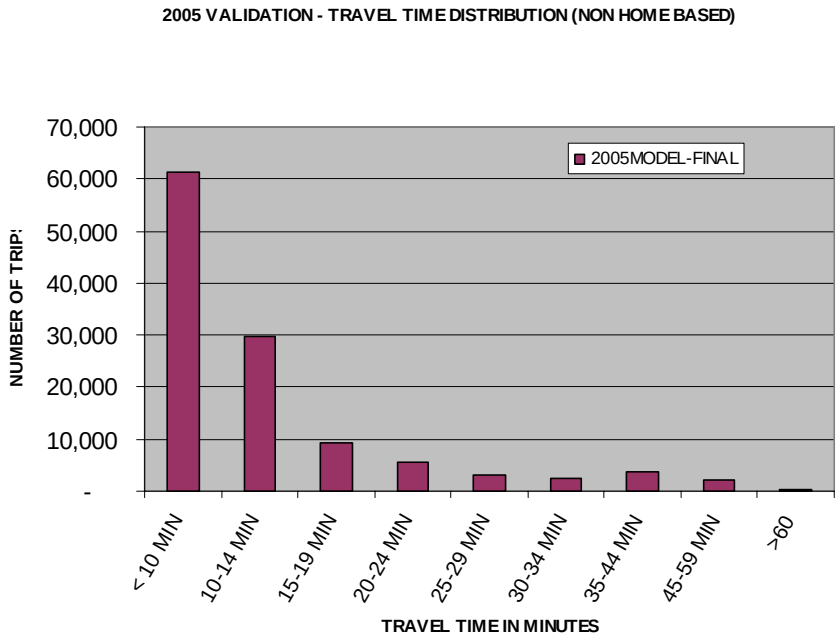


Figure 5-7: Home-Based Other Trips – Frequency Distribution



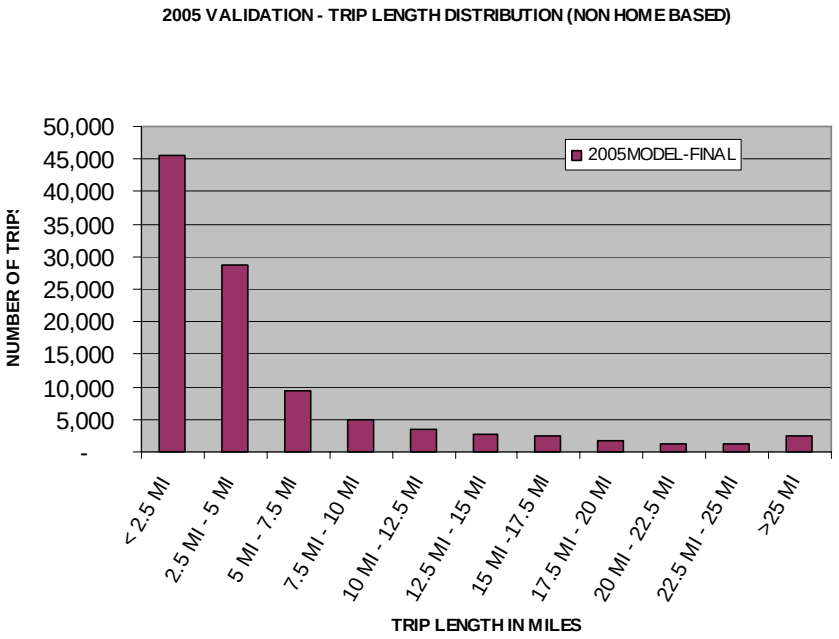


Figure 5-8: Non-Home Based Trips – Frequency Distribution

Table 5-3: Trip Distribution Calibration Results—Home-Based Work Trips by Income Group

	HBW – Income 1	HBW – Income 2	HBW – Income 3	HBW – Income 4	HBW - Total
Observed					
Average trip duration (minutes)	NA	NA	NA	NA	20.60
Average trip length (miles)	NA	NA	NA	NA	NA
Modeled					
Average trip duration (minutes)	19.0	18.6	18.2	21.0	19.95*
• Percent difference from observed					–3.15%
Average trip length (miles)	8.3	8.0	7.7	9.4	8.75*
• Percent difference from observed					

* Weighted average
NA = not available

Table 5-4: Trip Distribution Calibration Results—Non-Work Trip Purposes

	HBSchool	HBShop	HBOther	NHB
Observed				
Average trip duration (minutes)	NA	NA	NA	NA
Average trip length (miles)	NA	NA	NA	NA
Modeled				
Average trip duration (minutes)	12.3	13.0	13.7	12.4
• Percent difference from observed				
Average trip length (miles)	5.0	5.5	5.6	4.7
• Percent difference from observed				

NA = not available

Trip Length Distribution Macro

A macro to automatically compute trip length distributions, calculate average trip distances and times, and calculate intrazonal trips by trip purpose was added. In the model interface, there is an output file parameter called "TLD Table" located in the output files of the Trip Distribution step. It reports out the average length, average time, total trips, intrazonal trips, and the percentage of intrazonal trips for all resident and visitor trip purposes. A sample file is shown below:

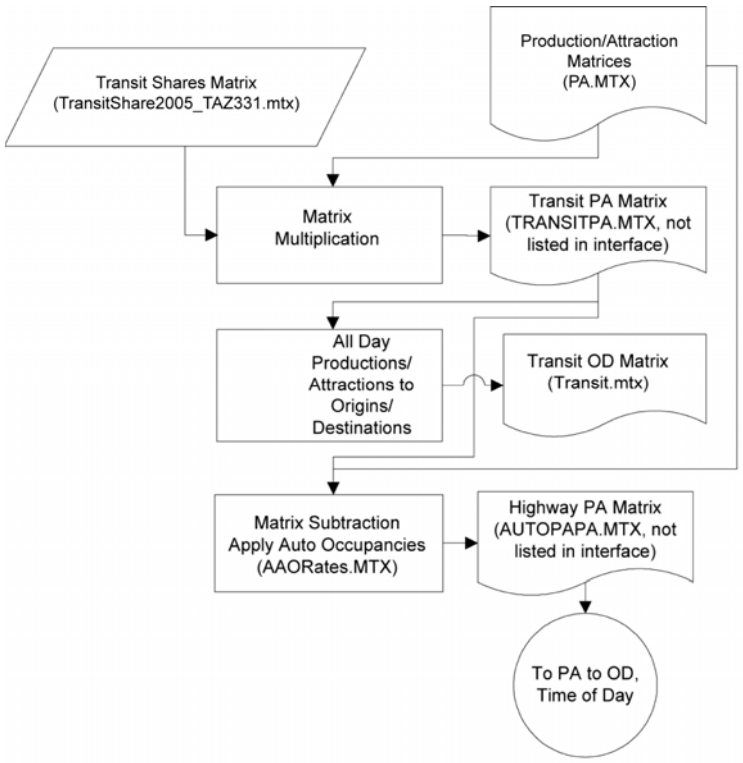
PURPOSE	AVGDIST	AVGTIME	TOTALTRIPS	INTRATRIPS	PERCENTINT
HBW_INC1_pk	8.286	19.029	5329.069	86.723	0.016
HBW_INC2_pk	8.023	18.643	6060.240	107.036	0.018
HBW_INC3_pk	7.726	18.215	16412.102	332.746	0.020
HBW_INC4_pk	9.354	20.987	39983.239	1158.228	0.029
HBSCH_opk	5.035	12.250	26871.861	941.860	0.035
HBSHOP_opk	5.470	13.005	38322.386	1697.532	0.044
HBOTHER_opk	5.564	13.712	156544.437	8281.828	0.053
NONHB_opk	4.651	12.405	117704.372	13948.410	0.119

Table 5-5 describes each field in the output trip length distribution table.

Table 5-5: Trip Length Distribution Table (tldtable.bin)

Field	Description
PURPOSE	Trip purpose, including total home-work and work-other trips aggregated by market segment
AVGDIST	Average trip distance in hundredths of miles
AVGTIME	Average trip time in hundredths of minutes
TOTALTRIPS	Total trips for trip purpose
INTRATRIPS	Intrazonal trips for trip purpose
PERCENTINT	Percentage of total trips that are intrazonal trips

6. MODE SPLIT



Introduction

In the travel models for the Douglas County and Carson City model, district-to-district mode split factors are applied to trip tables resulting from the trip distribution step to estimate person trips by transit and person trips by auto. Transit shares are applied to the total person trips to separate out the transit trips and the auto trips. Auto occupancy factors are then applied to convert person trips made in automobiles to vehicle trips for traffic assignment. For the travel models, aggregate auto occupancy models that account for differing characteristics of production zones were developed.

The auto occupancy models do not account for trip interchange characteristics such as travel time savings on HOV lanes or trip attraction zone characteristics (parking cost or special carpool parking preferences). Such characteristics might be taken into account when a mode choice model is developed or adopted for the region.

The transit share matrix for the Travel demand model was set to zero. This meant that all person trips coming out of the trip distribution was auto related. However, during the model development, a transit share matrix was added to so that in future transit share of the total person trips could be accounted for. Currently the model does not have any transit share associated with it.

Home-Based Auto Occupancy Models

A basic assumption underlying the estimation of the home-based average auto occupancy models is that the average auto occupancies are largely a function of socioeconomic characteristics in the production zone. The resulting models do not account for changes in average auto occupancy due to network characteristics (such as travel time or travel cost); however, they do account for variations in average household size, and when meaningful, different income levels. The models do not account for variation in auto occupancies at the attraction end of the trip, except as indirectly affected by the variation in average auto occupancies of trips attracted to the zone.

The home-based average auto occupancy models are an improvement over the typical state of the practice of using average regional auto occupancies by trip purpose for home-based trips. Experience in other areas has shown that auto occupancies vary throughout the region. The implementation of the home-based average auto occupancy models will cause variation in auto occupancies by production zone throughout the region.

The calibration of the home-based auto occupancy models was performed in a manner analogous to the calibration of trip production models. Specifically, cross-classification models were calibrated by summarizing and comparing average auto occupancies by trip purpose stratified by the income level and household size of the trip maker. Trip purposes and average auto occupancies were based on information reported by the auto driver for all purposes except home-based school. Adjacent cells in the cross-classification tables were combined to remove non-significant variation.

Tables 6-1 through 6-4 summarize the home-based average auto occupancies by trip purpose. The rates shown in Tables 6-1 through 6-4 are included in the TransCAD trip generation program implementation procedures since the zonal distributions of trip productions for households stratified by income group and household size are available within the trip generation routines. The TransCAD trip generation routine calculates and reports average home-based auto occupancies by trip purpose for each production zone.

Home-Based Work Average Auto Occupancies

No significant variation in the home-based work average auto occupancies was observed in the data when stratified by income group and household size of the trip maker. As a result, the home-based work average auto occupancy model defaults to the estimated regional average auto occupancy for home-based work trips. The lack of variation by income group and household size is reasonable considering that home-based work trips are less discretionary in nature than the other trip purposes.

Table 6-1: Home-Based Work Average Auto Occupancy Model

Income Group	Household Size				
	1	2	3	4	5+
Low (less than $19,999)	1.06	1.06	1.06	1.06	1.06
Lower-middle ($20,000–$29,999)	1.06	1.06	1.06	1.06	1.06
Upper-middle ($30,000–$49,499)	1.06	1.06	1.06	1.06	1.06
High ($50,000 or more)	1.06	1.06	1.06	1.06	1.06

Home-Based School Average Auto Occupancies

Table 6-2: Home-Based School Average Auto Occupancy Model

Income Group	Household Size				
	1	2	3	4	5+
Low (less than $19,999)	1.00	1.00	1.28	1.28	1.28
Lower-middle ($20,000–$29,999)	1.00	1.00	1.28	1.28	1.28
Upper-middle ($30,000–$49,499)	1.00	1.00	1.00	1.28	1.28
High ($50,000 or more)	1.00	1.00	1.00	1.28	1.28

Home-Based Shop Average Auto Occupancies

As can be seen in Table 6-3, home-based shop average auto occupancies vary by both income group and household size. As might be expected, average occupancies increase with increasing household size, since it is more likely for an extra household member to "ride along" on the shopping trip or be required for the shopping (for example, clothes shopping). There is also a tendency for average auto occupancies to decrease as income increases. This is probably due to increasing independence of household members as incomes increase. For many households, higher incomes are obtained as the employed household members become older, and probably have older children leading more independent lives. In addition, higher income households are more likely to own multiple vehicles.

Table 6-3: Home-Based Shop Average Auto Occupancy Model

Income Group	Household Size				
	1	2	3	4	5+
Low (less than $19,999)	1.07	1.35	2.20	2.20	2.20
Lower-middle ($20,000–$29,999)	1.07	1.35	1.39	1.91	1.91
Upper-middle ($30,000–$49,499)	1.07	1.35	1.39	1.91	1.91
High ($50,000 or more)	1.07	1.35	1.39	1.56	1.56

Home-Based Other Average Auto Occupancies

As with the home-based shop average auto occupancies, home-based other average occupancies vary by income group and household size. The variation is similar to that noted for the home-based shop trip purpose: average auto occupancies tend to increase with increasing household size and decrease with increasing income. The reasons for the variation are probably the same as for home-based shop trips.

Table 6-4: Home-Based Other Average Auto Occupancy Model

Income Group	Household Size				
	1	2	3	4	5+
Low (less than $19,999)	1.26	1.62	1.92	1.93	3.25
Lower-middle ($20,000–$29,999)	1.11	1.62	1.92	1.93	2.20
Upper-middle ($30,000–$49,499)	1.11	1.48	1.58	1.93	2.20
High ($50,000 or more)	1.11	1.34	1.58	1.93	2.20

Non-Home-Based Auto Occupancy Models

The Non-Home Based Auto Occupancy models developed for the Las Vegas region were used. A brief discussion of the calibration procedures used for the non-home-based average auto occupancy model is described below.

Since the actual location of the trip ends did not necessarily occur in the home zone locations of the trip makers, the use of demographic data to estimate average auto occupancies was illogical. Rather, non-home-based trips were related to the number of people (potential travelers) and the number of vehicles available in the zones where the non-home-based trips actually originated. This assertion was straightforward—the more potential travelers there were per vehicle, the higher the average auto occupancy for non-home-based trips.

District-based regression techniques were used to estimate the non-home-based auto occupancy model. Home-based person trips and home-based vehicle trips from the home-interview survey data were aggregated to 18 districts defined for the Las Vegas Valley area. Likewise, non-home-based person trips in autos and non-home-based auto trips were summarized to the production district of the actual trip. Note that person trips in autos were based on the auto occupancies reported by the auto drivers. Based on these data, the non-home-based average auto occupancies and the average "persons per auto arriving" were calculated for each district. The best regression models in terms of explanatory power (R^2) and significance of model coefficients were:

$$NHBAO = 0.36 + 0.83 * PPAARR \qquad R^2 = .60$$

where:

NHBAO = the non-home-based average auto occupancy

PPAARR = the persons per auto arriving for home-based non-work trip purposes

The R^2 value for the model suggests that it explains about 60 percent of the variance in non-home-based auto occupancies on a district basis. It should be noted that the model coefficients are similar to those estimated for several other cities using this type of aggregate non-home-based auto occupancy model.

If the PPAARR takes on the minimum value of 1.0, the resulting non-home-based average auto occupancies will be 1.19. At the regional average for PPAARR (1.41), the resulting modeled non-home-based average auto occupancy is 1.54. Note that this is slightly higher than the observed regional estimate for the non-home-based average auto occupancy, 1.49. This difference occurs because one of the observations used for the estimation of the model was excluded from the model estimation as an outlier (see Figure 6-1). While the model coefficients could have been

scaled to more closely match the regional non-home-based average auto occupancy when the regional average PPAARR was input, the changes were very small and well within the level of accuracy of the model.

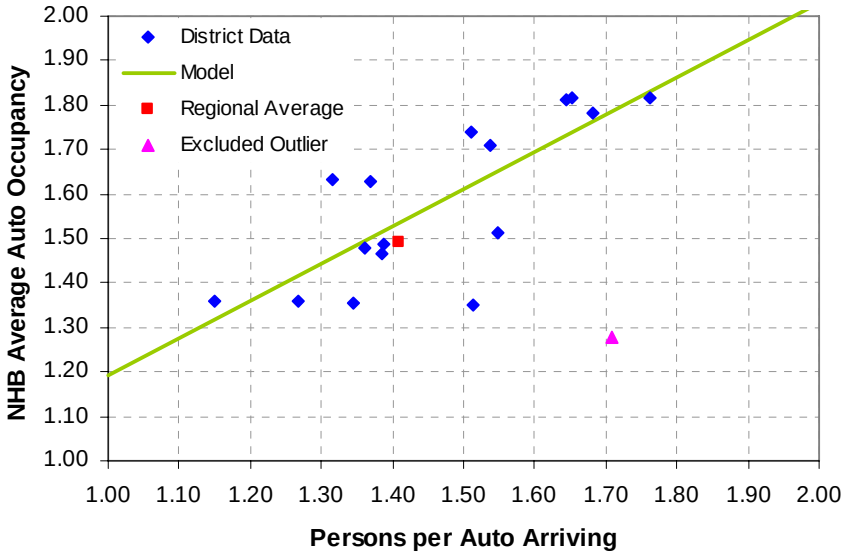


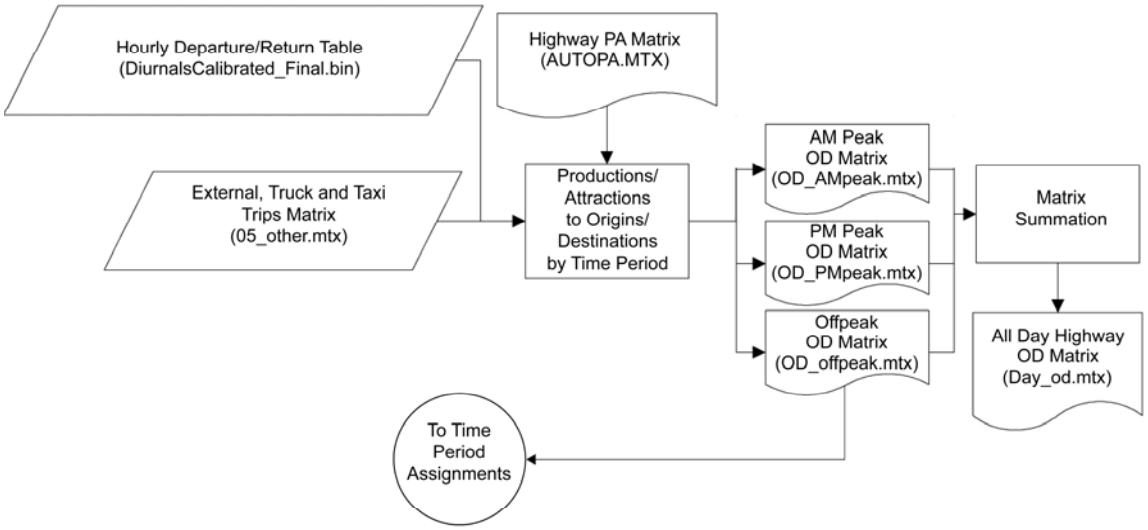
Figure 6-1: Non-Home-Based Average Auto Occupancy Calibration Data and Model

Since the district-based regressions were based on rates rather than total trips or some other extensive measure, there is no difficulty with applying the model at different geographic levels. When district based regression is used to estimate trip generation models, the constant must be factored out of the resulting model or the model must be run at the district level to give reasonable results. The above models can be applied at the zone level with no adjustment.

The number of persons per vehicle arriving at each zone can be determined from the results of the person trip distributions of home-based trips combined with the trip tables resulting from the applications of the home-based mode split and home-based auto occupancy models. In effect, the column sums of the home-based person trip matrices provide the persons arriving in each zone, and the column sums of the home-based vehicle trip matrices provide the number of vehicles arriving in each zone.

7. TRIP ASSIGNMENT

Production/Attraction to Origin/Destination and Time of Day Distribution



The Production/Attraction (PA) to Origin/Destination (OD) and time of day distribution process converts all auto PA person trip matrices into vehicle OD matrices by time period. For the Travel Demand Model, the 24 hour day was split into three time periods: 8 am to 9 am (AM Peak), 5 pm to 6 pm (PM Peak) and Offpeak (Rest).

Once the time periods were established, departure and return trip percentages were estimated for each time period. The percentages were estimated from a variety of sources and then the departure and return trip percentages were then adjusted to conform with the hourly counts. Table 7-1 lists the departure and return percentages for each trip purpose for each hour of the day.

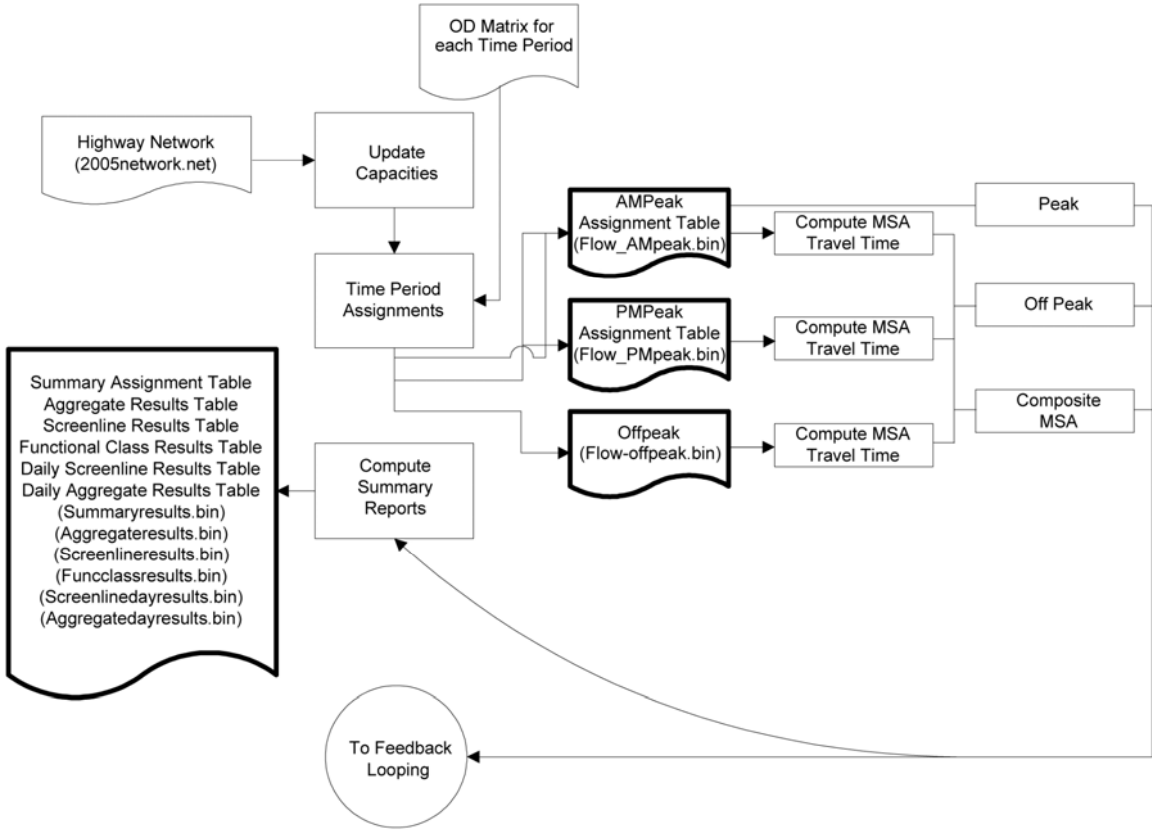
Other Trips Matrix

The input Other trips matrix consists of an estimated PA matrix of external-to-external and truck trips. The External to Internal and External to External for the base year was estimated based on the 2005 count information at the external stations. There are currently no truck trips in the model, but however a truck trip matrix was provided as part of the model development process. There are currently seven External/Gateway stations in the model.

Table 7-1: Departure and Return Percentages by Time of Day and Trip Purpose (Diurnalscalibrated_final. bin)

HOUR	DEP HBW	RET HBW	DEP HBSCH	RET HBSCH	DEP HBSHOP	RET HBSHOP	DEP HBOTHER	RET HBOTHER	DEP NHB	RET NHB	DEP EXT	RET EXT	DEP TRUCK	RET TRUCK
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	13.49	0.33	14.20	0.06	3.33	1.36	3.33	1.36	2.84	2.88	4.02	2.33	4.02	2.33
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.79	10.40	1.34	2.86	3.12	5.16	3.12	5.16	7.45	7.45	3.91	3.58	3.91	3.58
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	35.72	39.27	34.46	47.08	43.55	43.48	43.55	43.48	39.71	39.67	42.07	44.09	42.07	44.09
TOTAL	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00

Traffic Assignment



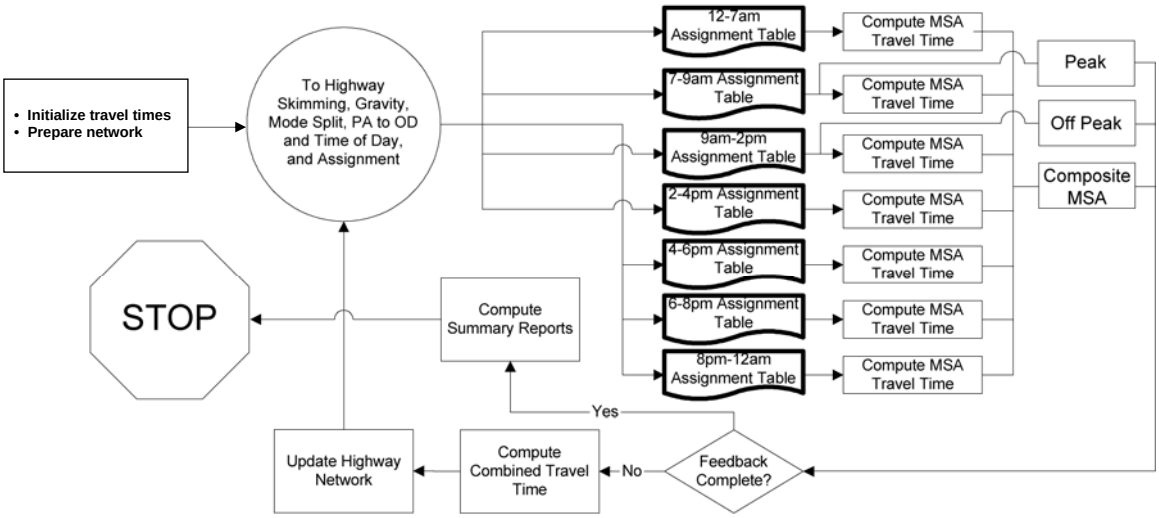
In this step, each of the time period OD matrices is assigned to the highway network. Different link capacities are computed for each time period assignment. The User Equilibrium method is utilized for each assignment with a default number of 40 iterations per assignment. After each assignment, a flow result table for each time period is generated. After all time period assignments are completed, several report tables are calculated:

- A summary assignment table that groups all time period assignments into one table, calculates a daily flow total, and compares all link counts to the flow totals for all time periods plus the daily total.
- An aggregate results table that compares link counts to flow totals grouped by functional class and time period.
- A screenline results table that compares links counts to flow totals grouped by screenline number and time period.
- A functional class results table that calculates total vehicle miles traveled (VMT) and average speeds by functional class.
- A screenline results table comparing link counts to flow totals. Unlike the previous screenline table, the counts used for this comparison come from the NDOT AADT counts instead of the hourly counts, thus only a daily comparison is available for this table.
- An aggregate results table that compares link counts to flow totals. Unlike the previous aggregate table, the counts used for this comparison come from the NDOT AADT counts instead of the hourly counts, thus only a daily comparison is available for this table.

Cold Start Flows and VMT

Cold start vehicle flows and VMT are also reported from the highway assignment. Used for air quality analysis, cold start flow represents the aggregate flow associated with only the first 505 seconds or other user-defined time period of travel in the network.

Feedback Looping



The feedback loop step uses the assignment model to calculate updated congested travel times. These congested travel times are then "fed back" into the network and the highway skim travel time matrix is re-calculated. Since this would change the results of the gravity model and any subsequent model that is in the stream process, all models are re-run with this updated information.

The purpose of a feedback loop is to generate realistic congested travel times so that the gravity model allocates trips to zones with more accuracy than by using free-flow travel times. The feedback loop is repeated several times until either the output flow volumes between successive loop iterations are within a convergence criteria or the number of iterations exceeds a specified amount. For resident trips, peak skims are used for home-based work trips while off peak skims are used for all other trip purposes.

The method of Multiple Successive Averages (MSA) is used to calculate the updated travel times used to feed back into highway skim. In this method, the calculated congested travel time by link is the combined average of loaded travel times calculated from previous feedback user-equilibrium iterations. The methodology is similar to the base method used for calculating volumes between iterations of user-equilibrium. This method of computing congested travel times has been shown in field tests to converge faster than the simpler method of feeding in directly the congested travel times resulting from the current user-equilibrium assignment.

Assignment Reports

Table 7-2 lists all the fields in the AMPEAK hour, PMPEAK hour and the OFFPEAK time period.

Table 7-2: Time Period Flow Table (FLOW_AMPEAK.BIN, FLOW_PMPEAK.BIN.BIN and FLOW_OFFPEAK.BIN)

Field	Description
ID1	Link ID
AB_Flow	Volume Flow in AB direction
BA_Flow	Volume Flow in BA direction
TOT_Flow	Total Volume Flow in both directions
AB_Time	Congested travel time in AB direction
BA_Time	Congested travel time in BA direction
MAX_Time	Congested travel time in both directions
AB_voc	Volume/Capacity ratio in AB direction
BA_voc	Volume/Capacity ratio in BA direction
MAX_voc	Volume/Capacity ratio in both directions
AB_vmt	Vehicel miles of travel in AB direction
BA_vmt	Vehicel miles of travel in BA direction
TOT_vmt	Vehicel miles of travel in both directions
AB_vht	Vehicel hours of travel in AB direction
BA_vht	Vehicel hours of travel in BA direction
TOT_vht	Vehicel hours of travel in both directions
AB_speed	Congested Speed in AB direction
BA_speed	Congested Speed in BA direction
AB_Cold_Flow	Volume Flow in the first 505 seconds of travel in AB direction
BA_Cold_Flow	Volume Flow in the first 505 seconds of travel in BA direction
TOT_Cold_Flow	Total Cold Flow in both directions
AB_Cold_V_Dist_T	Cold Flow VMT in AB direction
BA_Cold_V_Dist_T	Cold Flow VMT in BA direction

Table 7-3 describes all the fields in the summary reports file.

A functional classification report (see Table 7-4) outputs the daily Vehicle Miles traveled, the Total Daily flow and the Average speeds. The data is summarized by the different facility types that are present in the model.

Table 7-3: Results Table (Summaryresults.bin)

Field	Description
ID1	Link IDs
AB_TIME_XXXXXX / BA_TIME_XXXXXX	Congested Link trave times by direction and time period
Total_TIME_XXXXX	Total Congested travel time by time period
AB_FLOW_XXXXX / BA_FLOW_XXXXX	Assigned Link flows by direction and time period
Total_FLOW_XXXXX	Total Assigned Link Flows by time period
AB_DAY_COUNT / BA_DAY_COUNT	Daily Count by direction
TOT_DAY_COUNT	Total Daily Count
AB_DAY_FLOW / BA _DAY_FLOW	Total Daily Flow by direction
TOT_DAY_FLOW	Total Daily Flow
TOT_DAY_DIFF	Total Daily Difference - (Flow - Count)
AB_VOC_DAY / BA_VOC_DAY	Daily Volume -to-Capacity ration by direction
DAY_VMT	Total Daily VMT
AVG_DAY_SPEED	Daily Average speed
AB_VOC_XXXXX / BA_VOC_XXXXX	Volume -to-Capacity ration by direction and time period
AB_COUNT_XXXXX / BA_COUNT_XXXXX	Count Data by direction and time period
TOT_COUNT_AMPK	Total Counts by time period
AB_DIFF_XXXXX / BA_DIFF_XXXXX	Difference : Assigned Flow - Count by direction and time period
TOT_DIFF_AMPK	Total Difference : Assigned Flow - Count by time period

XXXXX = Time period

Table 7-4: Functional Class Results Table (FuncclassResults.bin)

Field	Description
FTYPE_NUM	Functional classification
DAY_VMT	Total daily vehicle miles of travel
TOT_DAY_FLOW	Total daily flow
[Avg AVG_DAY_SPEED]	Daily average speed

Traffic Assignment Validation

The 2005 validation results as compared to the counts are shown in Table 7-5 and the screenlines are shown in Figures 7-1 and 7-2. The comparison is made for the AM Peak, PM Peak, OFFPEAK and Daily traffic volumes. The overall total percent deviation from the screenline is 5 percent for AM, 4 percent for PM, –8 percent for the OFFPEAK and –6 percent for the Daily. Individual screenlines may experience more variations for the different time periods.

Table 7-5: Comparison of Traffic Volumes to Counts for All Time Periods

	AM PEAK					PM PEAK					OFFPEAK					DAILY				
SCREENLINE	MODEL	COUNT	DIFF	%DIFF	SQD ERR	MODEL	COUNT	DIFF	%DIFF	SQD ERR	MODEL	COUNT	DIFF	%DIFF	SQD ERR	MODEL	COUNT	DIFF	%DIFF	SQD ERR
1	1327	886	441	50%	194,481	1424	982	442	45%	195,364	13,116	11,470	1,646	14%	2,709,316	15,868	13,338	2,530	19%	6,400,900
2	355	312	43	14%	1,849	441	394	46	12%	2,209	4,420	1,256	3,163	252%	10,010,896	5,215	1,962	3,253	166%	10,582,009
3	966	717	249	35%	62,001	1,150	1,187	(37)	-3%	1,369	11,329	11,354	(25)	0%	625	13,445	13,258	187	1%	34,969
4	750	558	192	34%	36,864	823	749	74	10%	5,476	8,215	8,589	(374)	-4%	139,876	9,788	9,896	(108)	-1%	11,664
5	2941	2643	298	11%	88,804	3,386	2,962	424	14%	179,776	29,452	29,643	(191)	-1%	36,481	35,780	35,248	532	2%	283,024
6	1369	1759	-390	-22%	152,100	1,624	2,382	(758)	-32%	574,564	14,759	26,472	(11,713)	-44%	137,194,369	17,751	30,613	(12,862)	-42%	165,431,044
7	1652	1701	-49	-3%	2,401	1,993	2,598	(605)	-23%	366,025	19,503	29,202	(9,699)	-33%	94,070,601	23,148	33,501	(10,353)	-31%	107,184,609
8	1027	897	130	14%	16,900	891	1006	(115)	-11%	13,225	8,719	12,122	(3,403)	-28%	11,580,409	10,637	14,025	(3,388)	-24%	11,478,544
9	290	415	-126	-30%	15,625	355	645	(290)	-45%	84,100	3,382	6,615	(3,233)	-49%	10,452,289	4,026	7,675	(3,649)	-48%	13,315,201
10	762	723	39	5%	1,521	635	853	(218)	-26%	47,524	6,442	11,006	(4,564)	-41%	20,830,096	7,838	12,582	(4,744)	-38%	22,505,536
11	657	734	-77	-10%	5,929	335	899	(564)	-63%	318,096	4,069	11,415	(7,346)	-64%	53,963,716	5,060	13,048	(7,988)	-61%	63,808,144
12	2856	2587	269	10%	72,361	3,310	3,018	292	10%	85,264	28,822	31,089	(2,267)	-7%	5,139,289	34,988	36,694	(1,706)	-5%	2,910,436
13	3564	2586	978	38%	956,484	4,299	3,032	1,267	42%	1,605,289	37,388	30,725	6,663	22%	44,395,569	45,251	36,343	8,908	25%	79,352,464
14	2951	2283	668	29%	446,224	3,538	2,827	711	25%	505,521	30,728	28,457	2,271	8%	5,157,441	37,217	33,567	3,650	11%	13,322,500
15	908	1022	-114	-11%	12,996	1,194	1,055	139	13%	19,321	10,548	11,079	(530)	-5%	281,961	12,651	13,156	(505)	-4%	255,025
16	1917	1991	-74	-4%	5,476	2,105	2,469	(364)	-15%	132,496	21,559	21,085	474	2%	224,676	25,581	25,545	36	0%	1,296
17	646	569	77	14%	5,929	1,020	917	103	11%	10,609	7,274	9,743	(2,470)	-25%	6,095,961	8,941	11,229	(2,288)	-20%	5,234,944
18	3516	2572	944	37%	891,136	4,036	3,309	727	22%	528,529	36,436	34,037	2,399	7%	5,755,201	43,989	39,918	4,071	10%	16,573,041
19	4020	3161	859	27%	737,881	4,775	4,151	624	15%	389,376	42,073	40,782	1,291	3%	1,666,681	50,869	48,094	2,775	6%	7,700,625
20	742	543	199	37%	39,601	1,016	632	384	61%	147,456	9,139	6,792	2,346	35%	5,508,409	10,897	7,967	2,930	37%	8,584,900
21	2629	2252	377	17%	142,129	2,836	2,458	378	15%	142,884	26,695	27,168	(473)	-2%	223,729	32,160	31,878	282	1%	79,524
22	4248	3118	1130	36%	1,276,900	4,587	3,668	919	25%	844,561	44,083	42,278	1,805	4%	3,258,025	52,919	49,064	3,855	8%	14,861,025
23	3385	3156	229	7%	52,441	3,789	3,685	104	3%	10,816	35,381	37,337	(1,956)	-5%	3,825,936	42,554	44,178	(1,624)	-4%	2,637,376
24	88	142	-54	-38%	2,916	104	202	(98)	-49%	9,604	877	1,883	(1,006)	-53%	1,012,036	1,068	2,227	(1,159)	-52%	1,343,281
25	84	297	-212	-71%	45,369	122	239	(117)	-49%	13,689	921	1,875	(954)	-51%	910,116	1,127	2,411	(1,284)	-53%	1,648,656
26	1044	608	436	72%	190,096	1,201	645	556	86%	309,136	11,258	6,489	4,769	73%	22,743,361	13,502	7,742	5,760	74%	33,177,600
27	663	368	295	80%	87,025	1,028	542	485	89%	236,196	9,200	4,394	4,807	109%	23,097,636	10,891	5,304	5,587	105%	31,214,569
28	221	468	-247	-53%	61,009	233	427	(194)	-45%	37,636	2,319	4,968	(2,649)	-53%	7,017,201	2,774	5,863	(3,089)	-53%	9,541,921
29	752	719	33	5%	1,089	881	932	(51)	-5%	2,601	8,453	10,888	(2,435)	-22%	5,929,225	10,085	12,539	(2,454)	-20%	6,022,116
30	1369	1151	218	19%	47,524	1,777	1,323	454	34%	206,116	15,688	13,081	2,607	20%	6,796,449	18,833	15,555	3,278	21%	10,745,284
31	272	812	-541	-67%	291,600	440	902	(462)	-51%	213,444	3,025	8,763	(5,739)	-65%	32,924,644	3,736	10,477	(6,741)	-64%	45,441,081
32	291	670	-379	-57%	143,641	440	687	(247)	-36%	61,009	3,460	6,696	(3,236)	-48%	10,471,696	4,190	8,053	(3,863)	-48%	14,922,769
33	1383	1240	143	12%	20,449	1,783	1,323	460	35%	211,600	15,307	14,235	1,072	8%	1,149,184	18,472	16,798	1,674	10%	2,802,276
34	2329	2181	148	7%	21,904	2,444	2,582	(138)	-5%	19,044	23,594	30,892	(7,298)	-24%	53,260,804	28,368	35,655	(7,287)	-20%	53,100,369
35	1407	1046	361	35%	130,321	1,810	1,000	810	81%	656,100	16,381	12,392	3,989	32%	15,912,121	19,599	14,438	5,161	36%	26,635,921
36	2614	1800	814	45%	662,596	2,642	2,436	206	8%	42,436	26,326	27,911	(1,585)	-6%	2,512,225	31,583	32,147	(564)	-2%	318,096
37	1352	926	426	46%	181,476	1,588	1,130	458	41%	209,764	15,287	12,870	2,417	19%	5,841,889	18,227	14,926	3,301	22%	10,896,601
38	1037	980	57	6%	3,249	1,147	1,197	(50)	-4%	2,500	10,814	12,780	(1,966)	-15%	3,865,156	12,998	14,957	(1,959)	-13%	3,837,681
39	2006	1481	525	35%	275,625	2,052	1,891	161	9%	25,921	21,206	20,767	439	2%	192,721	25,264	24,139	1,125	5%	1,265,625
40	443	1091	-648	-59%	419,904	729	1,402	(672)	-48%	452,929	5,620	15,161	(9,541)	-63%	91,030,681	6,792	17,654	(10,862)	-62%	117,983,044
41	833	844	-11	-1%	121	1,017	1,054	(37)	-4%	1,369	8,829	9,085	(256)	-3%	65,536	10,679	10,983	(304)	-3%	92,416
42	2782	2622	160	6%	25,600	2,950	3,148	(198)	-6%	39,204	28,544	35,193	(6,649)	-19%	44,209,201	34,276	40,963	(6,687)	-16%	44,715,969
43	1026	518	509	98%	258,064	1,142	670	472	70%	222,784	9,741	6,215	3,525	57%	12,432,676	11,909	7,403	4,506	61%	20,304,036
44	53	766	-713	-93%	508,369	57	945	(887)	-94%	788,544	575	8,175	(7,600)	-93%	57,760,000	685	9,886	(9,201)	-93%	84,658,401
45	1502	1781	-279	-16%	77,841	1,984	1,909	75	4%	5,625	16,675	14,019	2,656	19%	7,054,336	20,162	17,709	2,453	14%	6,017,209
46	767	799	-32	-4%	1,024	996	916	80	9%	6,400	8,408	9,442	(1,034)	-11%	1,069,156	10,171	11,157	(986)	-9%	972,196
47	707	936	-229	-24%	52,441	977	826	151	18%	22,801	7,918	7,407	511	7%	261,121	9,602	9,169	433	5%	187,489
48	2557	2062	495	24%	245,025	2,935	2,471	464	19%	215,296	27,870	26,382	1,488	6%	2,214,144	33,361	30,915	2,446	8%	5,982,916
49	973	1443	-470	-33%	220,900	1,264	1,621	(357)	-22%	127,449	10,566	15,111	(4,546)	-30%	20,657,025	12,802	18,175	(5,373)	-30%	28,869,129
50	734	1254	-520	-41%	270,400	927	1,210	(283)	-23%	80,089	8,059	12,598	(4,539)	-36%	20,602,521	9,721	15,062	(5,341)	-35%	28,526,281
51	951	1416	-465	-33%	216,225	1,151	1,577	(426)	-27%	181,476	10,284	14,949	(4,665)	-31%	21,762,225	12,386	17,942	(5,556)	-31%	30,869,136
52	257	1147	-890	-78%	792,100	384	457	(73)	-16%	5,329	3,150	4,505	(1,355)	-30%	1,836,025	3,791	6,109	(2,318)	-38%	5,373,124
53	673	1338	-665	-50%	442,225	964	921	43	5%	1,849	7,673	13,649	(5,976)	-44%	35,712,576	9,311	15,908	(6,597)	-41%	43,520,409
54	182	401	-219	-55%	47,961	237	593	(356)	-60%	126,736	1,979	5,412	(3,434)	-63%	11,785,489	2,398	6,406	(4,008)	-63%	16,064,064
55	951	1326	-375	-28%	140,625	1,433	1,557	(124)	-8%	15,376	12,278	14,209	(1,931)	-14%	3,728,761	14,662	17,092	(2,430)	-14%	5,904,900
56	531	981	-450	-46%	202,500	630	937	(308)	-33%	94,249	5,601	8,637	(3,037)	-35%	9,217,296	6,761	10,555	(3,794)	-36%	14,394,436
57	2449	2896	-447	-15%	199,809	2,905	3,055	(150)	-5%	22,500	29,820	30,996	(1,176)	-4%	1,382,976	35,174	36,947	(1,773)	-5%	3,143,529
58	341	399	-58	-15%	3,364	441	385	56	15%	3,136	4,984	3,261	1,723	53%	2,968,729	5,766	4,045	1,721	43%	2,961,841
59	626	1460	-834	-57%	695,556	768	1,616	(848)	-52%	719,104	5,743	15,391	(9,648)	-63%	93,083,904	7,138	18,467	(11,329)	-61%	128,346,241
60	909	348	561	161%	314,721	1,072	481	592	123%	349,281	12,333	5,053	7,280	144%	52,998,400	14,314	5,882	8,432	143%	71,098,624
61	1531	617	914	148%	835,396	1,779	908	871	96%	758,641	16,531	10,669	5,862	55%	34,363,044	19,841	12,194	7,647	63%	58,476,609
62	1583	1178	405	34%	164,025	1,847	2,124	(277)	-13%	76,729	17,767	24,612	(6,845)	-28%	46,854,025	21,198	27,914	(6,716)	-24%	45,104,656
63	145	137	8	6%	64	218	218	-	0%	-	1,979	1,271	708	56%	501,264	2,342	1,626	716	44%	512,656
	83,896	79,834	4,062	**5%**	13,518,182	98,061	94,337	3,724	**4%**	12,783,542	900,575	982,002	(81,433)	**-8%**	1,189,709,127	1,082,532	1,156,173	(73,641)	**-6%**	1,569,541,957
Correlation=	**0.91**					**Correlation=**	**0.93**				**Correlation=**	**0.93**				**Correlation=**	**0.93**			
R^2=	**0.83**					**R^2=**	**0.86**				**R^2=**	**0.86**				**R^2=**	**0.86**			
RMSE=	**463.22**					**RMSE=**	**450.46**				**RMSE=**	**4345.60**				**RMSE=**	**4991.33**			
%RMSE=	**37%**					**%RMSE=**	**30%**				**%RMSE=**	**28%**				**%RMSE=**	**27%**			

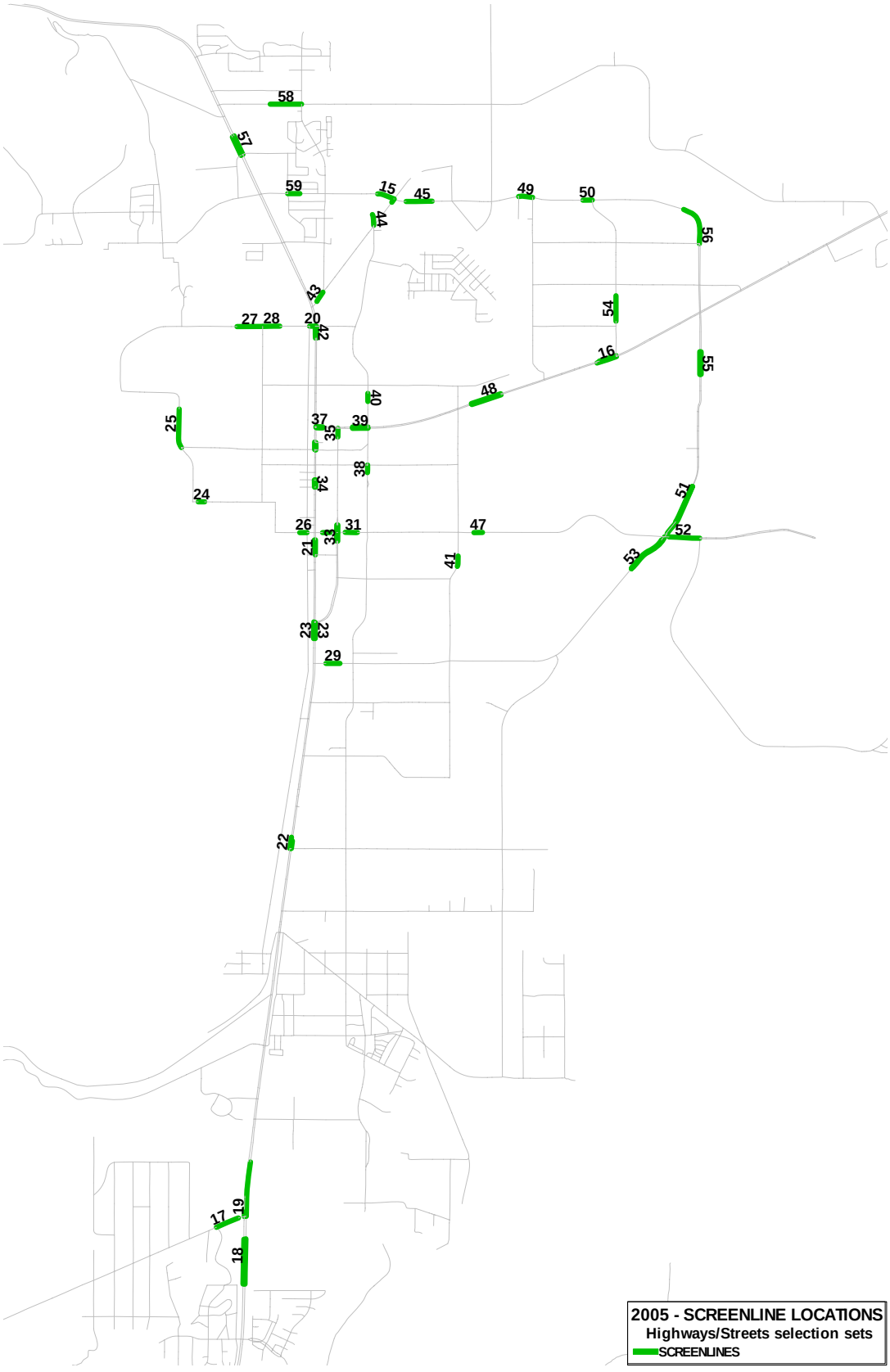


Figure 7-1: Screenline Locations in Carson City

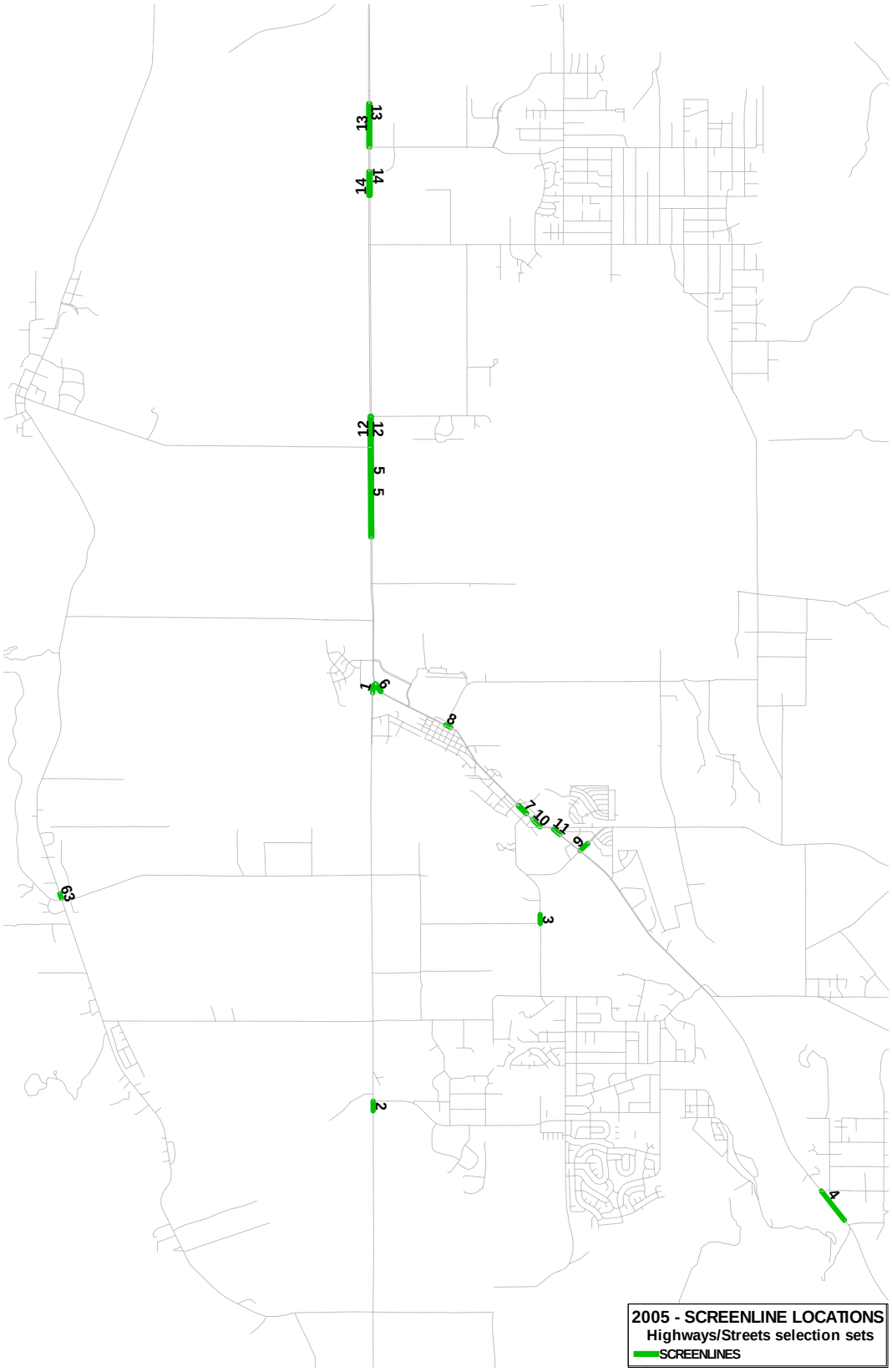


Figure 7-2: Screenline Locations in Douglas County

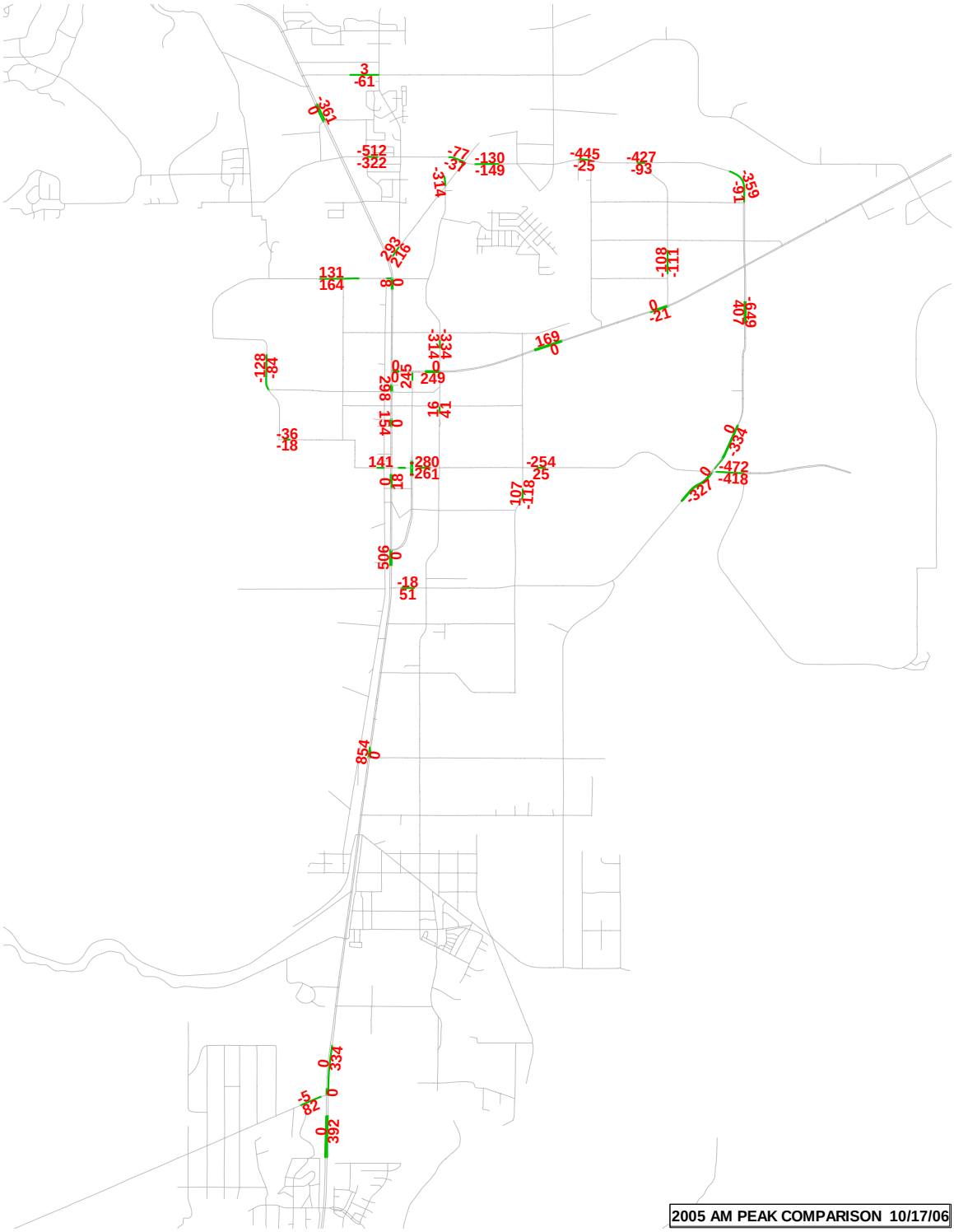


Figure 7-3: Comparison of AM Peak Hour Volumes to Traffic Counts in Carson City

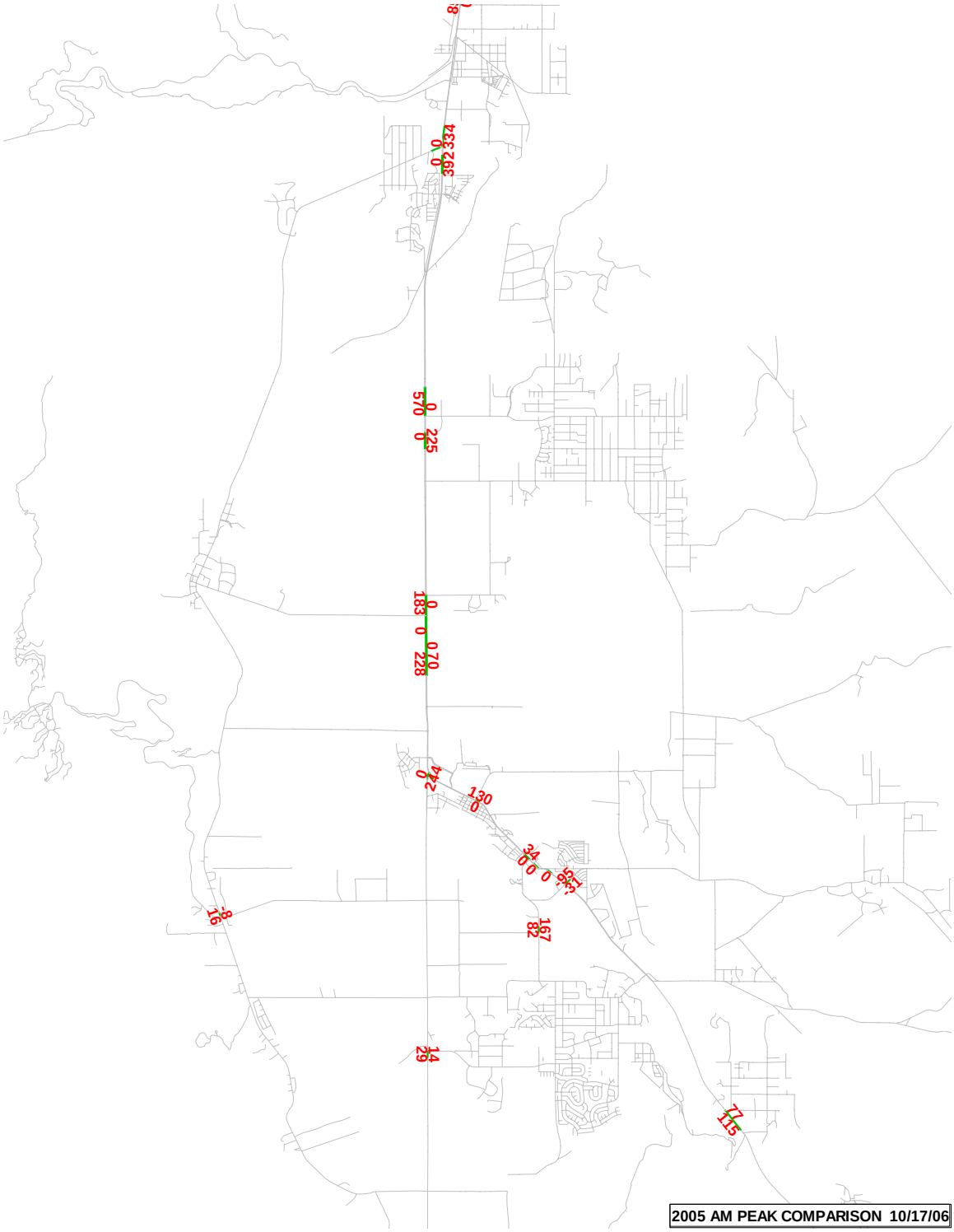


Figure 7-4: Comparison of AM Peak Hour Volumes to Traffic Counts in Douglas County

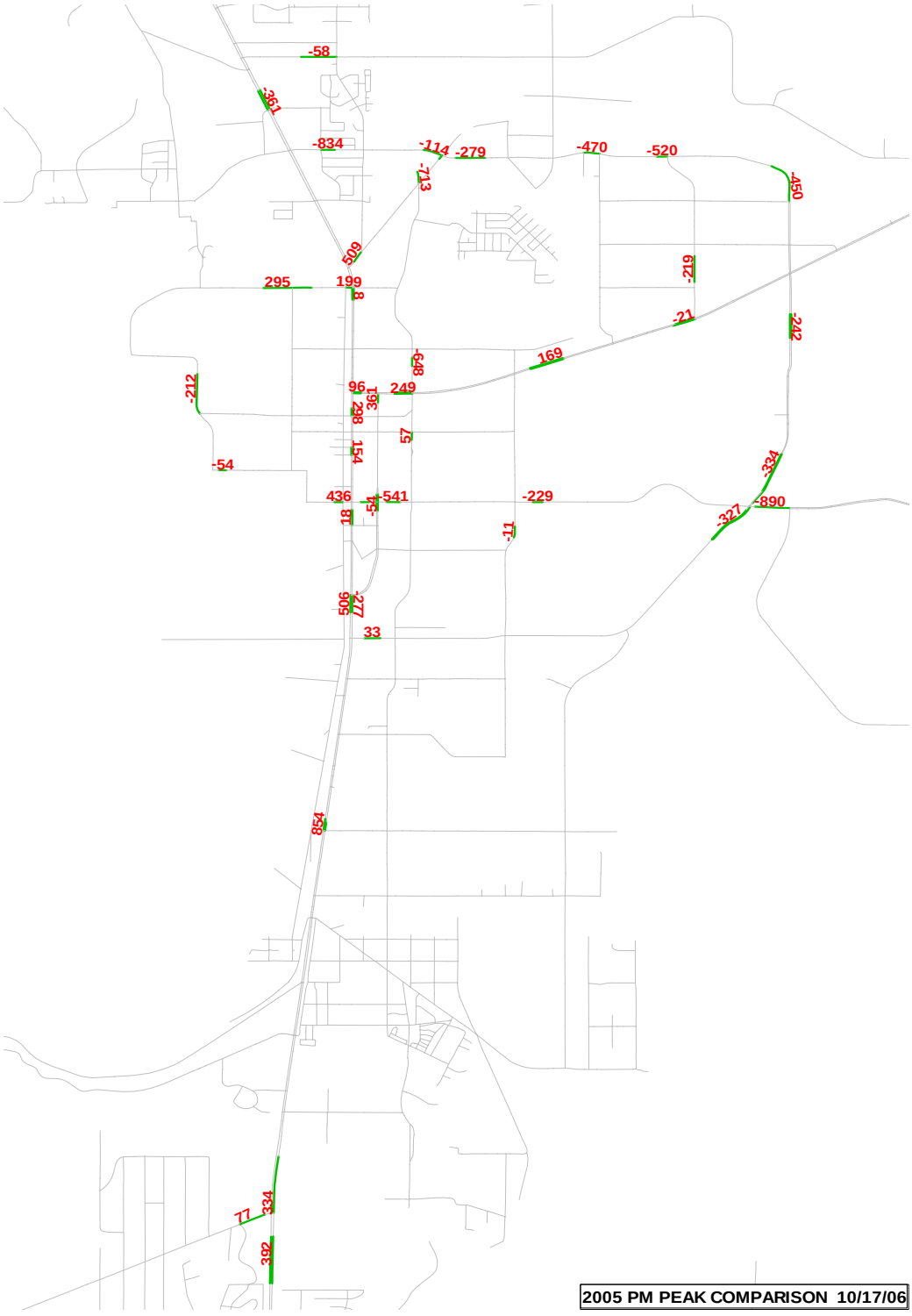


Figure 7-5: Comparison of PM Peak Hour Volumes to Traffic Counts in Carson City

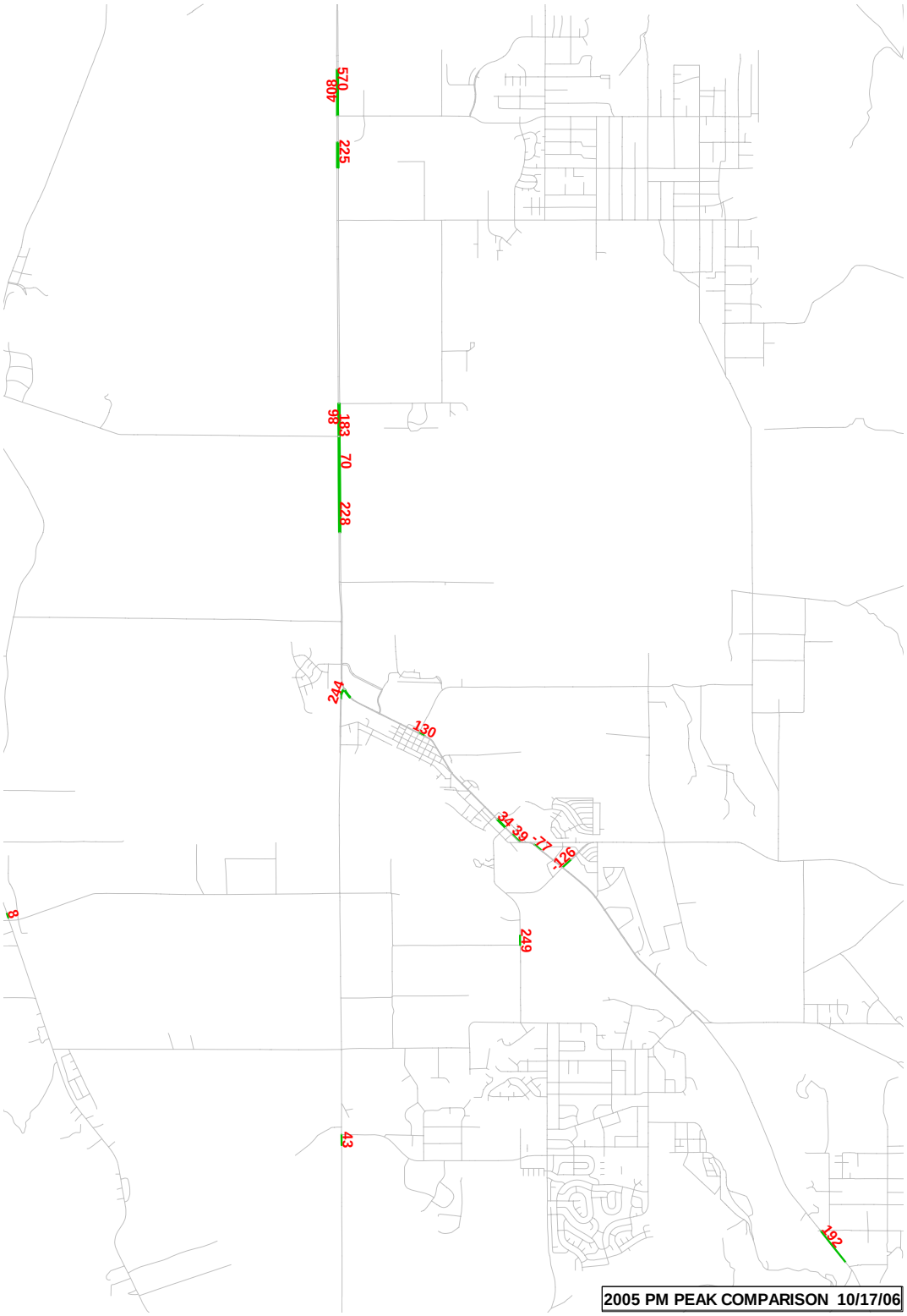


Figure 7-6: Comparison of PM Peak Hour Volumes to Traffic Counts in Douglas County

The 2005 model results for the vehicle hours traveled (VHT) and vehicle miles traveled (VMT) are shown in the Tables 7-6 through 7-8. The VMT and VHT are stratified by facility type and area type and are shown for the different time periods such as; AM, PM, OFFPEAK and daily. They are also summarized by county for the same time periods.

Table 7-6: Vehicle Miles Traveled and Vehicle Hours Traveled by Time Period—All Jurisdictions (2005)

2005 VALIDATION		ALL JURISDICTIONS/BOUNDRIES											
	NUM	AMPEAK			PMPEAK			OFFPEAK			DAILY		
GROUPING	LINKS	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED
ALL LINKS	7870	255,120	7,186	35.5	307,184	9,270	33.14	2,875,262	80,844	35.57	3,437,556	97,299	35.33
ALL, NO CENTROIDS	7256	240,249	6,591	36.45	288,164	8,509	33.87	2,714,240	74,402	36.48	3,242,643	89,502	36.23
BY FACILITY TYPE:													
GATEWAY LINKS	7	1,637	33	50	1,931	39	50	22,216	444	50	25,784	516	50
SYSTEM RAMPS	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ARTERIALS	1820	71,774	2,442	29.39	89,715	3,153	28.45	826,608	27,706	29.83	988,090	33,302	29.67
MAJOR ARTERIALS	795	108,927	2,733	39.85	124,827	3,512	35.54	1,223,354	31,200	39.21	1,457,107	37,445	38.91
RAMPS	0	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY	49	7,726	129	59.97	9,232	154	59.96	102,518	1,711	59.92	119,476	1,994	59.93
EXPRESSWAY	48	21,915	407	53.84	25,781	508	50.75	224,774	4,180	53.78	272,471	5,095	53.48
COLLECTORS	4537	28,270	847	33.37	36,677	1,143	32.1	314,771	9,161	34.36	379,714	11,151	34.05
CENTROIDS	614	14,870	595	25	19,020	761	25	161,022	6,441	25	194,913	7,797	25
BY AREA TYPE:													
CBD	351	9,703	391	24.84	11,758	662	17.76	104,700	4,064	25.76	126,161	5,117	24.66
URBAN	3564	83,049	2,807	29.58	101,771	3,687	27.61	926,366	32,358	28.63	1,111,187	38,852	28.6
RURAL	3334	145,860	3,360	43.4	172,703	4,122	41.9	1,660,959	37,536	44.25	1,979,511	45,019	43.97
CENTROID	614	14,870	595	25	19,020	761	25	161,022	6,441	25	194,913	7,797	25
GATEWAY	7	1,637	33	50	1,931	39	50	22,216	444	50	25,784	516	50
BY FACILITY AND AREA TYPE													
SYSTEM RAMPS / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ART / CBD	56	1,334	47	28.66	1,780	67	26.55	15,481	555	27.89	18,595	669	27.81
MAJOR ART / CBD	122	7,463	306	24.42	8,593	527	16.29	78,138	3,018	25.89	94,195	3,851	24.46
RAMPS / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
COLLECTOR / CBD	173	905	38	23.59	1,385	68	20.48	11,080	491	22.58	13,370	597	22.41
SYS RAMPS / URBAN	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ART / URBAN	1015	29,656	1,261	23.53	38,626	1,643	23.51	340,153	14,833	22.93	408,434	17,736	23.03
MAJOR ART / URBAN	390	39,425	1,121	35.16	44,392	1,443	30.77	434,231	13,018	33.36	518,049	15,582	33.25
RAMPS / URBAN	0	0	0	0	0	0	0	0	0	0	0	0	0

2005 VALIDATION		ALL JURISDICTIONS/BOUNDRIES											
	NUM	AMPEAK			PMPEAK			OFFPEAK			DAILY		
GROUPING	LINKS	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED
FREEWAY / URBAN	0	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY / URBAN	3	1,083	22	49.03	1,242	26	47.15	10,837	221	49.04	13,162	269	48.85
COLLECTOR / URBAN	2156	12,885	403	31.95	17,510	575	30.47	141,145	4,286	32.93	171,541	5,264	32.59
SYS RAMPS / RURAL	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ART / RURAL	749	40,783	1,135	35.93	49,308	1,443	34.17	470,974	12,319	38.23	561,060	14,897	37.66
MAJOR ART / RURAL	283	62,039	1,306	47.5	71,842	1,542	46.58	710,984	15,164	46.89	844,863	18,013	46.9
RAMPS / RURAL	0	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / RURAL	49	7,726	129	59.97	9,232	154	59.96	102,518	1,711	59.92	119,476	1,994	59.93
EXPRESSWAY / RURAL	45	20,832	385	54.12	24,539	482	50.95	213,937	3,959	54.04	259,309	4,825	53.74
COLLECTOR / RURAL	2208	14,480	406	35.7	17,782	500	35.53	162,546	4,384	37.08	194,802	5,290	36.83
CENTROIDS	614	14,870	595	25	19,020	761	25	161,022	6,441	25	194,913	7,797	25
GATEWAY LINKS	7	1,637	33	50	1,931	39	50	22,216	444	50	25,784	516	50
JURISDICTIONS:													
1 : CARSON CITY	2643	87,437	2,449	35.7	109,193	3,318	32.91	1,012,869	28,994	34.93	1,209,503	34,761	34.8
2 : DOUGLAS COUNTY	5041	157,005	4,505	34.85	185,357	5,676	32.65	1,717,920	48,492	35.43	2,060,267	58,673	35.11
3 : EXTERNALS	186	10,677	232	46.07	12,634	275	45.87	144,473	3,358	43.02	167,785	3,865	43.41

Table 7-7: Vehicle Miles Traveled and Vehicle Hours Traveled by Time Period—Carson City (2005)

2005 VALIDATION		CARSON CITY JURISDICTIONS											
	NUM	AMPEAK			PMPEAK			OFFPEAK			DAILY		
GROUPING	LINKS	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED
ALL LINKS	2643	87,437	2,449	35.7	109,193	3,318	32.91	1,012,869	28,994	34.93	1,209,503	34,761	34.8
ALL, NO CENTROIDS	2275	81,767	2,222	36.79	101,556	3,012	33.71	949,996	26,479	35.88	1,133,318	31,713	35.74
BY FACILITY TYPE:													
GATEWAY LINKS	0	0	0	0	0	0	0	0	0	0	0	0	0
SYSTEM RAMPS	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ARTERIALS	915	29,502	833	35.43	39,552	1,181	33.5	348,902	9,930	35.13	417,954	11,944	34.99
MAJOR ARTERIALS	352	38,628	1,056	36.59	43,705	1,345	32.49	437,539	12,559	34.84	519,872	14,959	34.75
RAMPS	0	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY	32	3,916	65	59.96	4,735	79	59.93	50,834	849	59.9	59,483	993	59.9
EXPRESSWAY	0	0	0	0	0	0	0	0	0	0	0	0	0
COLLECTORS	976	9,720	269	36.18	13,564	407	33.3	112,721	3,141	35.89	136,008	3,817	35.63
CENTROIDS	368	5,670	227	25	7,637	306	25	62,873	2,515	25	76,185	3,047	25
BY AREA TYPE:													
CBD	81	2,206	80	27.45	2,748	108	25.48	24,201	904	26.78	29,155	1,092	26.7
URBAN	1605	52,767	1,546	34.13	65,676	2,141	30.68	591,557	17,843	33.15	710,000	21,530	32.98
RURAL	589	26,793	596	44.97	33,132	764	43.38	334,238	7,732	43.23	394,163	9,091	43.36
CENTROID	368	5,670	227	25	7,637	306	25	62,873	2,515	25	76,185	3,047	25
GATEWAY	0	0	0	0	0	0	0	0	0	0	0	0	0
BY FACILITY AND AREA TYPE													
SYSTEM RAMPS / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ART / CBD	38	934	33	28.19	1,251	49	25.7	10,785	395	27.29	12,969	477	27.19
MAJOR ART / CBD	22	1,178	43	27.1	1,231	48	25.44	11,957	450	26.57	14,367	542	26.51
RAMPS / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
COLLECTOR / CBD	21	94	4	25.01	265	11	24.59	1,459	58	24.99	1,818	73	24.93
SYS RAMPS / URBAN	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ART / URBAN	764	21,069	625	33.68	28,461	901	31.59	240,203	7,161	33.54	289,733	8,688	33.35
MAJOR ART / URBAN	270	27,002	781	34.57	30,332	1,015	29.89	298,331	9,101	32.78	355,665	10,897	32.64
RAMPS / URBAN	0	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / URBAN	0	0	0	0	0	0	0	0	0	0	0	0	0

2005 VALIDATION		CARSON CITY JURISDICTIONS											
	NUM	AMPEAK			PMPEAK			OFFPEAK			DAILY		
GROUPING	LINKS	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED
EXPRESSWAY / URBAN	0	0	0	0	0	0	0	0	0	0	0	0	0
COLLECTOR / URBAN	571	4,696	139	33.67	6,883	225	30.57	53,023	1,581	33.54	64,602	1,945	33.21
SYS RAMPS / RURAL	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ART / RURAL	113	7,500	174	43.07	9,840	231	42.53	97,914	2,374	41.25	115,252	2,779	41.47
MAJOR ART / RURAL	60	10,447	231	45.24	12,141	282	43.06	127,250	3,007	42.31	149,840	3,520	42.57
RAMPS / RURAL	0	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / RURAL	32	3,916	65	59.96	4,735	79	59.93	50,834	849	59.9	59,483	993	59.9
EXPRESSWAY / RURAL	0	0	0	0	0	0	0	0	0	0	0	0	0
COLLECTOR / RURAL	384	4,930	125	39.32	6,416	171	37.43	58,239	1,502	38.78	69,588	1,798	38.69
CENTROIDS	368	5,670	227	25	7,637	306	25	62,873	2,515	25	76,185	3,047	25
GATEWAY LINKS	0	0	0	0	0	0	0	0	0	0	0	0	0
JURISDICTIONS:													
JURISDICTION TOTALS	2643	87,437	2,449	35.7	109,193	3,318	32.91	1,012,869	28,994	34.93	1,209,503	34,761	34.8

Table 7-8: Vehicle Miles Traveled and Vehicle Hours Traveled by Time Period—Douglas County (2005)

2005 VALIDATION		DOUGLAS COUNTY JURISDICTIONS											
	NUM	AMPEAK			PMPEAK			OFFPEAK			DAILY		
GROUPING	LINKS	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED
ALL LINKS	5041	157,005	4,505	34.85	185,357	5,676	32.65	1,717,920	48,492	35.43	2,060,267	58,673	35.11
ALL, NO CENTROIDS	4795	147,805	4,137	35.73	173,974	5,221	33.32	1,619,771	44,566	36.35	1,941,540	53,924	36.01
BY FACILITY TYPE:													
GATEWAY LINKS	2	292	6	50	345	7	50	3,967	79	50	4,604	92	50
SYSTEM RAMPS	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ARTERIALS	875	40,734	1,560	26.11	48,326	1,914	25.25	457,116	17,006	26.88	546,172	20,481	26.67
MAJOR ARTERIALS	417	67,359	1,611	41.8	77,654	2,089	37.18	745,922	17,632	42.3	890,934	21,332	41.76
RAMPS	0	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY	0	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY	48	21,915	407	53.84	25,781	508	50.75	224,774	4,180	53.78	272,471	5,095	53.48
COLLECTORS	3453	17,505	552	31.69	21,868	704	31.06	187,992	5,668	33.17	227,357	6,924	32.83
CENTROIDS	246	9,200	368	24.99	11,383	455	25.01	98,149	3,926	25	118,728	4,749	25
BY AREA TYPE:													
CBD	270	7,496	310	24.16	9,011	554	16.26	80,499	3,160	25.47	97,006	4,025	24.1
URBAN	1898	28,251	1,197	23.59	33,699	1,470	22.92	307,256	13,470	22.81	369,208	16,138	22.88
RURAL	2625	111,765	2,623	42.6	130,919	3,190	41.04	1,228,050	27,856	44.09	1,470,721	33,669	43.68
CENTROID	246	9,200	368	24.99	11,383	455	25.01	98,149	3,926	25	118,728	4,749	25
GATEWAY	2	292	6	50	345	7	50	3,967	79	50	4,604	92	50
BY FACILITY AND AREA TYPE													
SYSTEM RAMPS / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ART / CBD	18	401	13	29.83	529	18	28.81	4,697	160	29.39	5,627	192	29.37
MAJOR ART / CBD	100	6,285	262	23.97	7,361	479	15.37	66,181	2,568	25.77	79,828	3,309	24.12
RAMPS / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY / CBD	0	0	0	0	0	0	0	0	0	0	0	0	0
COLLECTOR / CBD	152	811	35	23.44	1,120	57	19.7	9,621	432	22.26	11,552	524	22.06
SYS RAMPS / URBAN	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ART / URBAN	243	7,215	590	12.23	8,546	689	12.41	81,332	6,946	11.71	97,092	8,224	11.81
MAJOR ART / URBAN	104	11,765	322	36.56	13,283	406	32.73	126,965	3,597	35.29	152,015	4,325	35.15
RAMPS / URBAN	0	0	0	0	0	0	0	0	0	0	0	0	0

2005 VALIDATION		DOUGLAS COUNTY JURISDICTIONS											
	NUM	AMPEAK			PMPEAK			OFFPEAK			DAILY		
GROUPING	LINKS	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED	VMT	VHT	AVG SPEED
FREEWAY / URBAN	0	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY / URBAN	3	1,083	22	49.03	1,242	26	47.15	10,837	221	49.04	13,162	269	48.85
COLLECTOR / URBAN	1548	8,189	264	31.05	10,628	350	30.41	88,122	2,706	32.57	106,939	3,319	32.22
SYS RAMPS / RURAL	0	0	0	0	0	0	0	0	0	0	0	0	0
MINOR ART / RURAL	614	33,119	957	34.6	39,250	1,207	32.52	371,088	9,901	37.48	443,454	12,064	36.76
MAJOR ART / RURAL	213	49,310	1,027	48	57,010	1,204	47.35	552,776	11,467	48.21	659,091	13,698	48.12
RAMPS / RURAL	0	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / RURAL	0	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY / RURAL	45	20,832	385	54.12	24,539	482	50.95	213,937	3,959	54.04	259,309	4,825	53.74
COLLECTOR / RURAL	1753	8,505	254	33.48	10,120	298	34	90,249	2,530	35.67	108,866	3,082	35.33
CENTROIDS	246	9,200	368	24.99	11,383	455	25.01	98,149	3,926	25	118,728	4,749	25
GATEWAY LINKS	2	292	6	50	345	7	50	3,967	79	50	4,604	92	50
JURISDICTIONS:													
JURISDICTION TOTALS	5041	157,005	4,505	34.85	185,357	5,676	32.65	1,717,920	48,492	35.43	2,060,267	58,673	35.11

8. TRAVEL FORECAST MODEL APPLICATION

The Douglas County/Carson City Travel Demand Model may be utilized to simulate existing conditions and to forecast future conditions. In addition to estimating peak hour and daily traffic volumes, the model may be used to assess traffic level of service conditions.

Table 8-1 shows the level of service (LOS) thresholds that were assumed for the traffic operational performance on the different facilities. The results for the 2005 model validation forecast are shown in Table 8-2 for the different facility types and LOS thresholds. Figure 8-1 illustrates the LOS on various facilities for the 2005 model validation and application.

Table 8-1: Level of Service Thresholds Used for LOS Calculations

Roadway Type	Total Daily Vehicles in Both Directions (ADT)				
	A	B	C	D	E
6-lane freeway	67,500	78,750	90,000	101,250	112,500
4-lane freeway	45,000	52,500	60,000	67,500	75,000
4-lane expressway	28,800	33,600	38,400	43,200	48,000
6-lane major arterial	36,000	42,000	48,000	54,000	60,000
4-lane major arterial	24,000	28,000	32,000	36,000	40,000
4-lane minor arterial	21,600	25,200	28,800	32,400	36,000
4-lane collector	18,000	21,000	24,000	27,000	30,000
2-lane major arterial	2,000	7,000	13,800	19,600	27,000
2-lane minor arterial	4200	4,200	13,800	16,400	16,900
2-lane collector	9,000	10,500	12,000	13,500	15,000
1-lane ramp	5,400	6,300	7,200	8,100	9,000

Table 8-2: Summary of the Daily Level of Service on Various Facilities

GROUPING	ALL JURISDICTIONS/BOUNDRIES				CARSON CITY JURISDICTIONS				DOUGLAS COUNTY JURISDICTIONS			
	LINKS	VMT	VHT	AVG SPEED	LINKS	VMT	VHT	AVG SPEED	LINKS	VMT	VHT	AVG SPEED
ALL LINKS	7,870	3,437,556	97,299	35.33	2,643	1,209,503	34,761		5,041	2,060,269	58,672	
BY FACILITY TYPE AND LOS THRESHOLDS												
SYSTEM RAMPS / LOS A	-	0	0	0	-	0	0	0	0	0	0	0
MINOR ART / LOS A	694	127,127	3,530	36.01	348	92,084	2,677	34.4	332	35,044	853	41.08
MAJOR ART / LOS A	292	451,459	9,677	46.65	42	73,917	1,608	45.97	250	377,542	8,069	46.79
RAMPS / LOS A	-	0	0	0	-	0	0	0	0	0	0	0
FREEWAY / LOS A	49	119,476	1,994	59.93	32	59,483	993	59.9	0	0	0	0
EXPRESSWAY / LOS A	-	0	0	0	-	0	0	0	0	0	0	0
COLLECTOR / LOS A	4,424	239,199	6,687	35.77	910	68,698	1,929	35.62	3,407	155,229	4,377	35.47
CENTROIDS / LOS A	614	194,913	7,797	25	368	76,185	3,047	25	246	118,728	4,749	25
GATEWAY LINKS / LOS A	7	25,784	516	50	-	0	0	0	2	4,604	92	50
SYSTEM RAMPS / LOS B	**-**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
MINOR ART / LOS B	401	128,568	3,112	41.31	156	29,303	803	36.49	245	99,265	2,309	42.99
MAJOR ART / LOS B	58	101,122	2,172	46.55	42	37,817	906	41.75	16	63,305	1,266	49.99
RAMPS / LOS B	-	0	0	0	-	0	0	0	0	0	0	0
FREEWAY / LOS B	0	0	0	0	-	0	0	0	0	0	0	0
EXPRESSWAY / LOS B	10	58,228	1,063	54.77	-	0	0	0	10	58,228	1,063	54.77
COLLECTOR / LOS B	71	68,757	1,914	35.92	51	50,584	1,354	37.36	19	17,096	532	32.13
CENTROIDS / LOS B	0	0	0	0	-	0	0	0	0	0	0	0
GATEWAY LINKS / LOS B	0	0	0	0	-	0	0	0	0	0	0	0
SYSTEM RAMPS / LOS C	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
MINOR ART / LOS C	634	501,837	13,094	38.32	387	226,993	6,510	34.87	239	272,490	6,532	41.72
MAJOR ART / LOS C	236	542,119	12,873	42.11	139	194,447	5,036	38.61	85	310,305	7,003	44.31
RAMPS / LOS C	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / LOS C	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY / LOS C	16	112,775	2,097	53.79	0	0	0	0	16	112,775	2,097	53.79
COLLECTOR / LOS C	19	16,737	596	28.08	8	10,797	360	30.02	11	5,940	236	25.13
CENTROIDS / LOS C	0	0	0	0	0	0	0	0	0	0	0	0
GATEWAY LINKS / LOS C	0	0	0	0	0	0	0	0	0	0	0	0
SYSTEM RAMPS / LOS D	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
MINOR ART / LOS D	49	120,278	3,605	33.36	23	66,934	1,803	37.12	18	31,735	978	32.45
MAJOR ART / LOS D	138	246,444	8,214	30	89	132,629	4,153	31.94	49	113,815	4,061	28.03

GROUPING	ALL JURISDICTIONS/BOUNDRIES				CARSON CITY JURISDICTIONS				DOUGLAS COUNTY JURISDICTIONS			
	LINKS	VMT	VHT	AVG SPEED	LINKS	VMT	VHT	AVG SPEED	LINKS	VMT	VHT	AVG SPEED
RAMPS / LOS D	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / LOS D	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY / LOS D	0	0	0	0	0	0	0	0	0	0	0	0
COLLECTOR / LOS D	12	10,704	370	28.95	6	5,479	160	34.29	6	5,226	210	24.88
CENTROIDS / LOS D	0	0	0	0	0	0	0	0	0	0	0	0
GATEWAY LINKS / LOS D	0	0	0	0	0	0	0	0	0	0	0	0
SYSTEM RAMPS / LOS E	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
MINOR ART / LOS E	3	2,436	119	20.42	0	0	0	0	3	2,436	119	20.42
MAJOR ART / LOS E	53	70,144	2,506	27.99	22	35,244	1,253	28.13	17	25,967	932	27.85
RAMPS / LOS E	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / LOS E	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY / LOS E	22	101,469	1,935	52.44	0	0	0	0	22	101,469	1,935	52.44
COLLECTOR / LOS E	8	39,739	1,348	29.49	1	450	15	30.63	7	39,289	1,333	29.47
CENTROIDS / LOS E	0	0	0	0	0	0	0	0	0	0	0	0
GATEWAY LINKS / LOS E	0	0	0	0	0	0	0	0	0	0	0	0
SYSTEM RAMPS / LOS F	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
MINOR ART / LOS F	39	107,843	9,840	10.96	1	2,640	151	17.49	38	105,203	9,690	10.86
MAJOR ART / LOS F	18	45,819	2,003	22.87	18	45,819	2,003	22.87	0	0	0	0
RAMPS / LOS F	0	0	0	0	0	0	0	0	0	0	0	0
FREEWAY / LOS F	0	0	0	0	0	0	0	0	0	0	0	0
EXPRESSWAY / LOS F	0	0	0	0	0	0	0	0	0	0	0	0
COLLECTOR / LOS F	3	4,578	236	19.38	0	0	0	0	3	4,578	236	19.38
CENTROIDS / LOS F	0	0	0	0	0	0	0	0	0	0	0	0
GATEWAY LINKS / LOS F	0	0	0	0	0	0	0	0	0	0	0	0
SUMMARY TOTAL												
TOTAL - LOS A	6,080	1,157,957	30,200	42.54	1,700	370,367	10,254	36.12	4,237	691,147	18,140	38.1
TOTAL - LOS B	540	356,674	8,262	41.00	249	117,704	3,063	38.43	290	237,893	5,171	46.01
TOTAL - LOS C	905	1,173,468	28,660	41.78	534	432,237	11,906	36.31	351	701,510	15,868	44.21
TOTAL - LOS D	199	377,426	12,189	29.49	118	205,042	6,116	33.53	73	150,775	5,249	28.73
TOTAL - LOS E	86	213,789	5,909	31.72	23	35,694	1,268	28.15	49	169,161	4,320	39.16
TOTAL - LOS F	60	158,239	12,080	16.78	19	48,459	2,154	22.49	41	109,780	9,926	11.06

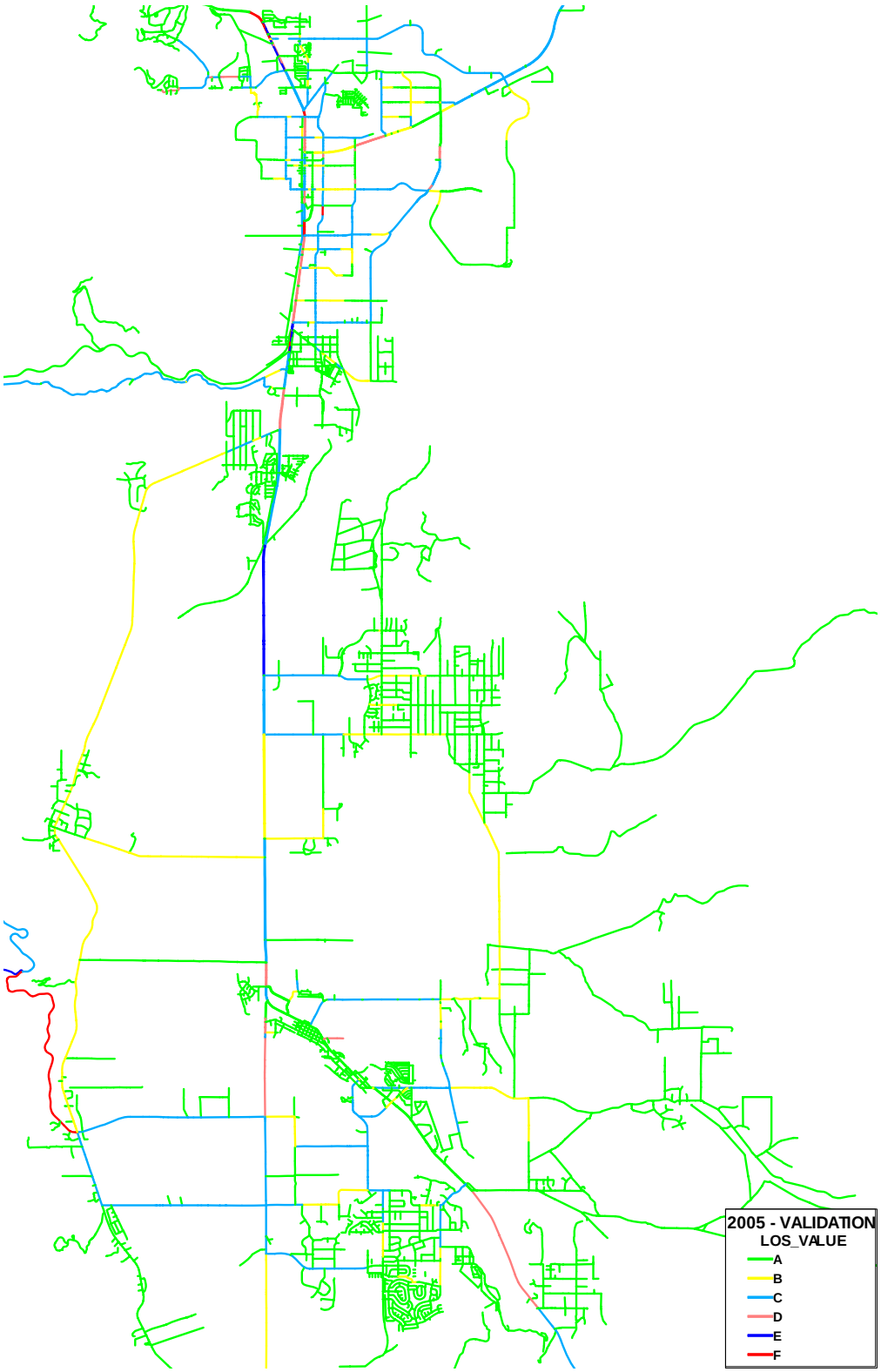


Figure 8-1: Daily Level of Service on Various Facilities

Appendix A: Input Files, Output Files and Parameters

This appendix describes the input and output files and parameters of the travel demand model.

Field_Name	Type	Index	Description
ID	Integer (4 bytes)	*	unique Link Identification Number
Length	Real (8 bytes)	*	Length of the link in miles
Dir	Integer (2 bytes)	*	one-way or 2-way links (Dir 0 = 2-way link, Dir 1 = 1-way link)
NAME	Character	*	Street Name
FTYPE_NUM	Integer (4 bytes)	*	Integer form of the Functional Class of a link
FTYPE_NAME	Character	*	Type of Functional Class
ATYPE_NUM	Integer (4 bytes)	*	Integer form for Area Type
ATYPE_NAME	Character	*	Description of Area Type (i.e. suburban, rural, etc.)
AB_LANES	Real (8 bytes)	*	Number of Lanes on AB Direction of Link
BA_LANES	Real (8 bytes)	*	Number of Lanes on BA Direction of Link
UNIT	Integer (4 bytes)	*	Must have a Value of 1
DAY_LANE_CAP	Integer (4 bytes)		Daily Capacity per Lane
HOUR_LANE_CAP	Integer (4 bytes)		Hourly Lane Capacity
AB_SPEED	Real (8 bytes)		Free-flow Speed on AB Direction of Link (mi/hr)
BA_SPEED	Real (8 bytes)		Free-flow Speed on BA Direction of Link (mi/hr)
ALPHA	Real (8 bytes)		BPR Coefficient
BETA	Real (8 bytes)		BPR Exponent
ALT_BETA	Real (8 bytes)		Alternative BPR Coefficient for a link
ALT_CAP	Real (8 bytes)		Alternative Capacity for a link
ALT_SPEED	Real (8 bytes)		Alternative Speed for a link
AB_TIME	Real (8 bytes)		Free Flow Travel Time in AB Direction of Link (computed as Length/AB_SPEED * 60)
BA_TIME	Real (8 bytes)		Free Flow Travel Time in BA Direction of Link (computed as Length/BA_SPEED * 60)
AB_TIME_PK	Real (8 bytes)		For First Iteration =*Time, else time is AMPEAK
BA_TIME_PK	Real (8 bytes)		For First Iteration =*Time, else time is AMPEAK
AB_TIME_OPK	Real (8 bytes)		For First Iteration =*Time, else time is OFFPEAK
BA_TIME_OPK	Real (8 bytes)		For First Iteration =*Time, else time is OFFPEAK
AB_TIME_AVG	Real (8 bytes)		For First Iteration =*Time, else Weighted Average of (AMPEAK, PMPEAK & OFFPEAK)
BA_TIME_AVG	Real (8 bytes)		For First Iteration =*Time, else Weighted Average of (AMPEAK, PMPEAK & OFFPEAK)
AB_HR_CAP	Integer (4 bytes)		One Hour Link Capacity
BA_HR_CAP	Integer (4 bytes)		One Hour Link Capacity
AB_10HR_CAP	Integer (4 bytes)		Offpeak Capacity is equal to 10* Hour Link Capacity
BA_10HR_CAP	Integer (4 bytes)		Offpeak Capacity is equal to 10* Hour Link Capacity
AB_DAY_CAP	Integer (4 bytes)		Daily Link Capacity
BA_DAY_CAP	Integer (4 bytes)		Daily Link Capacity
AB_COUNT_AM	Integer (4 bytes)	**	am peak hour Counts
BA_COUNT_AM	Integer (4 bytes)	**	am peak hour Counts
AB_COUNT_PM	Integer (4 bytes)	**	pm peak hour Counts
BA_COUNT_PM	Integer (4 bytes)	**	pm peak hour Counts
AB_COUNT_OP	Integer (4 bytes)	**	offpeak period Counts
BA_COUNT_OP	Integer (4 bytes)	**	offpeak period Counts
AB_ALLCOUNT	Integer (4 bytes)	**	Daily Counts
BA_ALLCOUNT	Integer (4 bytes)	**	Daily Counts

Field_Name	Type	Index	Description
PD_DAILY	Integer (4 bytes)		
INCLUDECOUNT	Integer (4 bytes)	**	Used in Summary Calculations - 1 indicates link will be used for comparisons of count to Peak/offpeak hour traffic volumes
INCLUDEALLCOUNT	Integer (4 bytes)	**	Used in Summary Calculations - 1 indicates link will be used for comparisons of count to Daily traffic volumes
SCREENLINE	Integer (4 bytes)	**	Used in Summary Calculations - 1 indicates the link will be used for hourly count calculations
SCREENLINEALL	Integer (4 bytes)	**	Used in Summary Calculations - 1 indicates the link will be used for Daily count calculations
JURISDICTIONS	Integer (4 bytes)		Jurisdiction boundaries
KFACTOR_DISTRICTS	Integer (4 bytes)		kfactor districts based on links
CFCC	Character		
FID_COUNTY	Integer (4 bytes)		
COUNTY_NAME	Character		
STATE_NAME	Character		
STATE_FIPS	Character		
CNTY_FIPS	Character		
FIPS	Character		

Field names denoted with a "*" are required fields for the model. Field names denoted with a "**" are required only in the model option that compares count information with model flow results.

Speed-Capacity Lookup Table (speedcaptable_final.bin)

Field	Description
FTYPE_NUM	Functional Classification
ATYPE_NUM	Area Type Classification
R_Speed	Free Flow Speeds for cross classification
R_DAYCAP	Daily capacity per lane for cross classification
R_HOURCAP	Hourly capacity per lane for cross classification
R_ALPHAVALUE	BPR alpha value for cross classification
R_BETAVALUE	BPR Beta Value for cross classification

Turn Penalties Table (05_Turn_Prohib.bin)*

Field	Description
FROM_ID	From Link ID
TO_ID	To Link ID
PENALTY	Penalty Value, missing value denotes a prohibition

Demographics Table (2005_Landuse.bin)

Field	Description
TAZ	Zone Number
DISTRICT	District Number
POP	Population
DU	Dwelling Units
OCCDU	Occupied Dwelling Units
TOTEMP	Total Employment
HOTEL	Hotel Employment
OFFICE	Office Employment
INDUST	Industrial Employment
R_SHOP	Retail Shop Employment

Field	Description
C_SHOP	Commercial Shop Employment
OTHER_RET	Other Retail Employment
OTHER_NON	Non Retail Employment
RETAIL	Total Retail Employment
CASINO_SPGN	Casino Special Generator
F18	Elementary/Middle School Employment
F912	High School Enrollment
F13	Community College Employment
MED_INC	Median Income for the TAZ
JURIS_ID	Jurisdiction ID

Residential Trip Generation Table

Field	Description
ID	TAZ
HBWP_INC1	Home Based Work Income group 1 Productions
HBWA_INC1	Home Based Work Income group 1 Attractions
HBWP_INC2	Home Based Work Income group 2 Productions
HBWA_INC2	Home Based Work Income group 2 Attractions
HBWP_INC3	Home Based Work Income group 3 Productions
HBWA_INC3	Home Based Work Income group 3 Attractions
HBWP_INC4	Home Based Work Income group 4 Productions
HBWA_INC4	Home Based Work Income group 4 Attractions
HBSCHP	Home Based School Productions
HBSCHA	Home Based School Attractions
HBSHOPP	Home Based Shop Productions
HBSHOPA	Home Based Shop Attractions
HBOTHERP	Home Based Other Productions
HBOTHERA	Home Based Other Attractions
NONHBP	Non Home Based Productions
NONHBA	Non Home Based Attractions

Friction Factors Table (FrictionFactors.bin)

Field	Description	Function
TIME	Travel Time	
HBW	Home Based Work Friction Factors (By Income Group)	Gamma
HBSCH	Home Based School Friction Factors	Gamma
HBSHOP	Home Based Shop Friction Factors	Gamma
HBOTHER	Home Based Other Friction Factors	Table
NONHB	Non Home Based Friction Factors	Table

Time Period Flow Table (Flow_ampeak.MTX, Flow_pmpeak.MTX, etc.)

Field	Description
ID1	Link ID
AB_Flow	Volume Flow in AB direction
BA_Flow	Volume Flow in BA direction
TOT_Flow	Total Volume Flow in both directions
AB_Time	Congested travel time in AB direction
BA_Time	Congested travel time in BA direction
MAX_Time	Congested travel time in both directions

Field	Description
AB_voc	Volume/Capacity ratio in AB direction
BA_voc	Volume/Capacity ratio in BA direction
MAX_voc	Volume/Capacity ratio in both directions
AB_vmt	Vehicel miles of travel in AB direction
BA_vmt	Vehicel miles of travel in BA direction
TOT_vmt	Vehicel miles of travel in both directions
AB_vht	Vehicel hours of travel in AB direction
BA_vht	Vehicel hours of travel in BA direction
TOT_vht	Vehicel hours of travel in both directions
AB_speed	Congested Speed in AB direction
BA_speed	Congested Speed in BA direction
AB_Cold_Flow	Volume Flow in the first 505 seconds of travel in AB direction
BA_Cold_Flow	Volume Flow in the first 505 seconds of travel in BA direction
TOT_Cold_Flow	Total Cold Flow in both directions
AB_Cold_V_Dist_T	Cold Flow VMT in AB direction
BA_Cold_V_Dist_T	Cold Flow VMT in BA direction

Results Table (Summaryresults.bin)*Field is irrelevant or not created if count information is not present in the line geography and if the option to compare counts with flows is turned off.

Summary Results Table

Field	Description
ID1	Link IDs
AB_TIME_XXXXXX / BA_TIME_XXXXXX	Congested Link trave times by direction and time period
Total_TIME_XXXXX	Total Congested travel time by time period
AB_FLOW_XXXXX / BA_FLOW_XXXXX	Assigned Link flows by direction and time period
Total_FLOW_XXXXX	Total Assigned Link Flows by time period
AB_DAY_COUNT / BA_DAY_COUNT	Daily Count by direction
TOT_DAY_COUNT	Total Daily Count
AB_DAY_FLOW / BA _DAY_FLOW	Total Daily Flow by direction
TOT_DAY_FLOW	Total Daily Flow
TOT_DAY_DIFF	Total Daily Difference - (Flow - Count)
AB_VOC_DAY / BA_VOC_DAY	Daily Volume -to-Capacity ration by direction
DAY_VMT	Total Daily VMT
AVG_DAY_SPEED	Daily Average speed
AB_VOC_XXXXX / BA_VOC_XXXXX	Volume -to-Capacity ration by direction and time period
AB_COUNT_XXXXX / BA_COUNT_XXXXX	Count Data by direction and time period
TOT_COUNT_AMPK	Total Counts by time period
AB_DIFF_XXXXX / BA_DIFF_XXXXX	Difference : Assigned Flow - Count by direction and time period
TOT_DIFF_AMPK	Total Difference : Assigned Flow - Count by time period

XXXXX = Time period

Aggregate Table (AggregateResults.bin)*

Field	Description
FTYPE_NUM	Functional Classification
Total_FLOW_AMPK	Total Assigned Flow - AM Peak
TOT_COUNT_AMPK	Total Count - AM Peak
TOT_DIFF_AMPK	Total Difference - AM peak
Total_FLOW_PMPK	Total Assigned Flow - PM Peak
TOT_COUNT_PMPK	Total Count - PM Peak
TOT_DIFF_PMPK	Total Difference - PM peak
Total_FLOW_OFPK	Total Assigned Flow - OFFPeak
TOT_COUNT_OFPK	Total Count - OFFPeak
TOT_DIFF_OFPK	Total Difference - OFFPeak
TOT_DAY_FLOW	Total daily Flow
TOT_DAY_COUNT	Total Daily Flow
TOT_DAY_DIFF	Total Daily Difference
PERCENT_RMSE_AMPK	Percent RMSCE- AMPeak
PERCENT_RMSE_PMPK	Percent RMSCE- PMPeak
PERCENT_RMSE_OFPK	Percent RMSCE- OFFPeak
PERCENT_RMSE_TOT	Percent RMSCE- Total

*Table is only created if count information is present and if option to compare counts with flows is turned on.

Screenline Results Table (ScreenlineResults.bin)*

Field	Description
SCREENLINE	Screenline Number
Total_FLOW_AMPK	Total Assigned Flow - AM peak
TOT_COUNT_AMPK	Total Count - AM peak
TOT_DIFF_AMPK	Total Difference - AM Peak
Total_FLOW_PMPK	Total Assigned Flow - PM peak
TOT_COUNT_PMPK	Total Count - PM peak
TOT_DIFF_PMPK	Total Difference - PM Peak
Total_FLOW_OFPK	Total Assigned Flow - OFFPeak
TOT_COUNT_OFPK	Total Count - OFFPeak
TOT_DIFF_OFPK	Total Difference - OFFPeak
TOT_DAY_FLOW	Total Daily Flow
TOT_DAY_COUNT	Total Daily Count
TOT_DAY_DIFF	Total Daily Difference

*Table is only created if count information is present and if option to compare counts with flows is turned on.

Functional Class Results Table (FuncclassResults.bin)*

Field	Description
FTYPE_NUM	Functional classification
DAY_VMT	Total Daily Vehicle Miles of Travel
TOT_DAY_FLOW	Total Daily flow
[Avg AVG_DAY_SPEED]	Daily Average Speed

Screenline Day Results Table (ScreenlineDayResults.bin)*

Field	Description
SCREENLINEALL	Daily Screenlines
TOT_DAY_FLOW	Total Daily Flow
TOT_DAY_COUNT	Total Daily Count
TOT_DAY_DIFF	Total Daily Difference

*Table is only created if count information is present and if option to compare counts with flows it turned on.

Aggregate Day Table (AggregateDayResults.bin)*

Field	Description
FTYPE_NUM	Function Classification
TOT_DAY_FLOW	Total Daily Flow by functiona class
TOT_DAY_COUNT	Total Daily Counts by functiona class
TOT_DAY_DIFF	Toal Daily Difference by functional class

*Table is only created if count information is present and if option to compare counts with flows is turned on.

The following table describes each of the generic parameters assignment step in the model:

Parameter	Description
Assignment Type	1 = use User Equilibrium, 2 = use Stochastic User Equilibrium
Random Factor	If SUE is chosen from above, perturb link travels times by this percent, otherwise ignore
Calculate counts*	1 = If network has count information, calculate differences between flows and counts
Assignment iterations	Number of assignment iterations to use for each time period (must choose List radio button)

If you are running the model on a network that does not have count fields (i.e., a future year network), you must put in a "0" for this parameter. By default, the model runs the base year 2005 network which does have count fields and thus, the default for this parameter is "1."

2005 Travel Demand Model Setup Files

	INPUT FILES	OUTPUT FILES
Model Year Dir	**2005**	**Contained in Each Model Year Directory**
Create network	2005\Inputs\2005_NETWORK_FINAL.dbd 2005\Inputs\05_Turn-Prohib.bin common\speedcaptable_final.bin common\Zone_layer_taz331.dbd	network.net
Trip Generation	2005\Inputs\2005_Landuse.bin common\hhsizelkup.dbf common\hhinclkup.dbf common\crossclasstriprates.mtx common\attractiontriprates.bin	demographics_dist.bin tripgen.bin
Network Skimming	common\addtime_331.mtx	sp_pk.mtx sp_opk.mtx
Trip Distribution	common\frictionfactors.bin	pa.mtx
	common\kfactors_taz331.MTX	tldtable.bin
Modal split	common\aaorates.mtx common\diurnalscalibrated_final.bin 2005\Inputs\05_Other.mtx common\TransitShare_taz331.mtx	aao_output.bin transit.mtx od_ampeak.mtx od_pmpeak.mtx od_offpeak.mtx day_od.mtx
Assignment	-	flow_ampeak.bin flow_pmpeak.bin flow_offpeak.bin summaryresults.bin aggregateresults.bin funcclassresults.bin screenlineresults.bin screenlinedayresults.bin aggregatedayresults.bin

Appendix B: 2005 Land Use Data

TAZ	DISTRICT	POP	DU	OCCDU	TOTEMP	HOTEL	OFFICE	INDUST	R_SHOP	C_SHOP	OTHER_RET	OTHER_NON	RETAIL	CASINO_SPGN	F18	F912	F13	MED_INC	JURIS_ID
1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120711	1
9	1	615	261	251	726	0	0	548	35	70	68	5	173	0	0	0	0	119561	1
10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143836	1
11	1	6	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	143711	1
12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143711	1
13	1	345	143	135	0	0	0	0	0	0	0	0	0	0	0	0	0	109423	1
14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109423	1
15	1	337	125	123	12	0	3	6	3	0	0	0	3	0	0	0	0	142104	1
16	1	4	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	38000	1
17	1	217	93	92	165	0	0	143	0	15	7	0	22	0	0	0	0	115966	1
18	1	149	54	54	21	0	0	21	0	0	0	0	0	0	0	0	0	132661	1
19	1	105	35	35	1027	0	0	934	15	10	68	0	93	0	0	0	0	126961	1
20	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131961	1
21	1	0	0	0	65	0	65	0	0	0	0	0	0	0	0	0	0	135711	1
22	1	0	0	0	350	0	0	350	0	0	0	0	0	0	0	0	0	133336	1
23	1	460	179	173	807	0	0	632	0	18	157	0	175	0	0	0	0	45400	1
24	1	91	35	34	0	0	0	0	0	0	0	0	0	0	0	0	0	38333	1
25	1	106	46	44	6	0	0	6	0	0	0	0	0	0	0	0	0	37000	1
26	1	113	48	48	8	8	0	0	0	0	0	0	0	0	0	0	0	145211	1
27	1	921	368	350	92	0	25	3	25	39	0	0	64	0	0	0	0	39421	1
28	1	184	94	91	0	0	0	0	0	0	0	0	0	0	0	0	0	40421	1
29	1	422	175	170	25	25	0	0	0	0	0	0	0	0	0	0	0	35421	1
30	1	397	178	166	3	0	0	3	0	0	0	0	0	0	0	0	0	44500	1
31	1	33	15	15	7	0	0	7	0	0	0	0	0	0	0	0	0	41000	1

TAZ	DISTRICT	POP	DU	OCCDU	TOTEMP	HOTEL	OFFICE	INDUST	R_SHOP	C_SHOP	OTHER_RET	OTHER_NON	RETAIL	CASINO_SPGN	F18	F912	F13	MED_INC	JURIS_ID
32	1	73	38	35	70	6	30	17	0	17	0	0	17	0	0	0	0	49500	1
33	1	255	93	89	0	0	0	0	0	0	0	0	0	0	0	0	0	52500	1
34	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52500	1
35	1	0	0	0	802	23	716	38	15	10	0	0	25	0	0	0	0	51500	1
36	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51500	1
37	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51500	1
38	1	377	138	135	1102	0	890	0	82	110	0	20	192	0	0	0	0	131741	1
39	1	1085	562	544	1306	0	1300	6	0	0	0	0	0	0	0	0	0	123741	1
40	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	138241	1
41	1	49	25	24	3	0	0	3	0	0	0	0	0	0	0	0	0	134241	1
42	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134241	1
43	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134241	1
44	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134241	1
45	1	289	108	107	0	0	0	0	0	0	0	0	0	0	0	0	0	152241	1
46	1	763	353	348	204	0	106	0	3	30	0	65	33	0	0	0	0	50122	1
47	1	24	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	147241	1
48	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147241	1
49	1	224	102	99	9	0	0	3	0	0	3	3	3	0	0	0	0	47205	1
50	1	867	524	445	64	10	0	3	15	36	0	0	51	0	0	0	0	25250	1
51	1	1236	477	436	3	0	3	0	0	0	0	0	0	0	0	0	0	26912	1
52	1	629	267	257	508	0	27	25	0	456	0	0	456	0	0	0	0	31091	1
53	1	0	0	0	298	0	283	15	0	0	0	0	0	0	0	0	0	30136	1
54	1	743	443	417	0	0	0	0	0	0	0	0	0	0	526	0	0	32911	1
55	1	397	129	126	0	0	0	0	0	0	0	0	0	0	0	0	0	31649	1
56	1	220	94	86	166	0	0	145	0	15	6	0	21	0	0	0	0	42400	1
57	1	10	4	4	150	0	0	102	3	0	45	0	48	0	0	0	0	107309	1
58	1	22	11	11	0	0	0	0	0	0	0	0	0	0	0	0	0	101025	1
59	1	5	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	140034	1
60	1	150	62	58	335	0	0	332	0	3	0	0	3	0	0	0	0	112434	1
61	1	145	63	61	18	0	0	3	0	15	0	0	15	0	0	0	0	115267	1
62	1	657	238	231	36	0	29	7	0	0	0	0	0	0	0	0	0	51250	1
63	1	570	227	221	13	0	3	10	0	0	0	0	0	0	0	0	0	46380	1
64	1	737	345	334	141	0	0	79	0	62	0	0	62	0	0	0	0	34219	1
65	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34219	1

TAZ	DISTRICT	POP	DU	OCCDU	TOTEMP	HOTEL	OFFICE	INDUST	R_SHOP	C_SHOP	OTHER_RET	OTHER_NON	RETAIL	CASINO_SPGN	F18	F912	F13	MED_INC	JURIS_ID
66	1	765	310	293	0	0	0	0	0	0	0	0	0	0	0	0	0	33743	1
67	1	572	239	229	0	0	0	0	0	0	0	0	0	0	0	0	0	33309	1
68	1	435	186	180	71	0	0	7	0	64	0	0	64	0	0	0	0	38571	1
69	1	14	9	8	3	0	0	3	0	0	0	0	0	0	0	0	0	33375	1
70	1	1397	663	649	80	0	80	0	0	0	0	0	0	0	1046	0	0	36580	1
71	1	256	91	81	0	0	0	0	0	0	0	0	0	0	0	0	0	41136	1
72	1	1035	368	360	122	0	3	75	0	41	3	0	44	0	0	0	0	35074	1
73	1	1318	439	432	3	0	0	3	0	0	0	0	0	0	0	0	0	45330	1
74	1	118	46	42	0	0	0	0	0	0	0	0	0	0	0	0	0	40303	1
75	1	641	265	259	178	0	25	3	0	0	0	150	0	0	0	0	0	38982	1
76	1	219	64	54	142	4	12	0	7	119	0	0	126	0	0	0	0	36309	1
77	1	324	129	128	525	0	382	120	0	23	0	0	23	0	0	0	0	25361	1
78	1	1356	479	462	296	0	40	69	47	130	10	0	187	0	0	0	0	53136	1
79	1	562	230	213	173	0	30	140	0	3	0	0	3	0	0	0	0	30912	1
80	1	0	0	0	195	0	27	0	0	165	3	0	168	0	0	0	0	28750	1
81	1	693	326	301	432	0	218	99	23	92	0	0	115	0	0	0	0	44496	1
82	1	1182	595	567	280	0	175	15	40	43	7	0	90	0	0	0	0	22152	1
83	1	588	286	267	439	8	330	6	6	89	0	0	95	0	0	0	0	25145	1
84	1	250	146	136	167	15	86	15	30	21	0	0	51	0	750	0	3151	41023	1
85	1	216	101	98	50	0	50	0	0	0	0	0	0	0	0	0	0	38762	1
86	1	0	0	0	135	0	40	3	82	10	0	0	92	0	0	0	0	20125	1
87	1	87	60	53	6	5	0	0	0	0	0	1	0	0	0	0	0	27625	1
88	1	8	3	3	45	19	3	3	7	13	0	0	20	0	0	0	0	20875	1
89	1	0	0	0	169	0	160	0	7	2	0	0	9	0	0	0	0	25333	1
90	1	223	130	109	122	23	0	6	43	50	0	0	93	0	0	0	0	35093	1
91	1	151	75	71	221	0	50	6	15	150	0	0	165	0	0	0	0	32174	1
92	1	20	15	14	119	2	95	0	0	15	7	0	22	0	0	0	0	28500	1
93	1	80	42	37	15	0	0	0	0	0	0	15	0	0	0	0	0	33000	1
94	1	528	229	227	0	0	0	0	0	0	0	0	0	0	0	0	0	53307	1
95	1	71	34	34	0	0	0	0	0	0	0	0	0	0	0	0	0	41739	1
96	1	361	165	162	3	0	0	0	0	3	0	0	3	0	0	0	0	45739	1
97	1	80	34	31	3	0	0	0	0	3	0	0	3	0	0	0	0	157241	1
98	1	312	119	118	7	0	0	7	0	0	0	0	0	0	0	0	0	160158	1
99	1	35	16	16	0	0	0	0	0	0	0	0	0	0	0	0	0	159491	1

TAZ	DISTRICT	POP	DU	OCCDU	TOTEMP	HOTEL	OFFICE	INDUST	R_SHOP	C_SHOP	OTHER_RET	OTHER_NON	RETAIL	CASINO_SPGN	F18	F912	F13	MED_INC	JURIS_ID
100	1	18	11	9	0	0	0	0	0	0	0	0	0	0	0	0	0	166241	1
101	1	370	137	134	3	0	0	3	0	0	0	0	0	0	0	0	0	105009	1
102	1	123	45	37	3	0	0	0	0	3	0	0	3	0	0	0	0	139408	1
103	1	116	90	73	0	0	0	0	0	0	0	0	0	0	0	0	0	168741	1
104	1	367	168	158	3	0	0	3	0	0	0	0	0	0	0	0	0	154901	1
105	1	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	29355	1
106	1	458	203	200	184	0	175	6	0	3	0	0	3	0	624	0	0	31288	1
107	1	179	112	108	95	0	82	6	0	7	0	0	7	0	0	0	0	42339	1
108	1	411	185	181	0	0	0	0	0	0	0	0	0	0	0	0	0	35125	1
109	1	131	64	60	249	0	246	3	0	0	0	0	0	0	0	0	0	45125	1
110	1	80	53	49	217	5	164	18	0	30	0	0	30	0	0	0	0	50010	1
111	1	65	48	38	373	205	89	0	9	70	0	0	79	0	0	0	0	41268	1
112	1	3	2	2	880	550	310	0	0	20	0	0	20	0	0	0	0	39750	1
113	1	0	0	0	540	0	540	0	0	0	0	0	0	0	0	0	0	50650	1
114	1	190	100	93	660	10	638	7	0	5	0	0	5	0	0	0	0	43019	1
115	1	2156	985	916	251	0	241	3	0	7	0	0	7	0	0	0	0	37566	1
116	1	563	218	215	87	0	62	0	25	0	0	0	25	0	0	0	0	36187	1
117	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68417	1
118	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68417	1
119	1	8	4	4	610	250	290	0	0	70	0	0	70	0	0	0	0	67417	1
120	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66417	1
121	1	1160	635	471	41	0	0	7	0	34	0	0	34	0	0	0	0	41736	1
122	1	782	309	292	408	188	0	115	0	105	0	0	105	0	0	0	0	30781	1
123	1	546	154	151	50	0	50	0	0	0	0	0	0	0	0	0	0	37448	1
124	1	2301	665	657	6	0	0	3	0	0	3	0	3	0	0	0	0	35590	1
125	1	2	1	1	120	0	110	7	3	0	0	0	3	0	0	0	0	73917	1
126	1	263	104	102	22	0	0	22	0	0	0	0	0	0	0	0	0	129851	1
127	1	471	183	171	0	0	0	0	0	0	0	0	0	0	0	0	0	124434	1
128	1	1259	479	461	10	0	0	7	0	3	0	0	3	0	0	0	0	129045	1
129	1	387	175	168	329	0	200	96	0	3	30	0	33	0	0	0	0	112767	1
130	1	282	120	119	0	0	0	0	0	0	0	0	0	0	0	0	0	128184	1
131	1	201	79	78	117	0	3	101	0	10	3	0	13	0	0	0	0	131601	1
132	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92634	1
133	1	0	0	0	35	0	0	35	0	0	0	0	0	0	0	0	0	133017	1

TAZ	DISTRICT	POP	DU	OCCDU	TOTEMP	HOTEL	OFFICE	INDUST	R_SHOP	C_SHOP	OTHER_RET	OTHER_NON	RETAIL	CASINO_SPGN	F18	F912	F13	MED_INC	JURIS_ID
134	1	17	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	151434	1
135	1	394	175	158	53	0	50	3	0	0	0	0	0	0	0	0	0	137372	1
136	1	93	36	36	10	0	0	10	0	0	0	0	0	0	0	0	0	135184	1
137	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135184	1
138	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135184	1
139	1	21	9	8	380	0	335	45	0	0	0	0	0	0	0	0	0	72417	1
140	1	0	0	0	60	0	0	15	0	45	0	0	45	0	0	0	0	30342	1
141	1	94	37	36	3	0	0	0	0	0	3	0	3	0	0	0	0	119034	1
142	1	476	219	213	315	0	148	10	7	150	0	0	157	0	0	0	0	70417	1
143	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69417	1
144	1	48	18	18	0	0	0	0	0	0	0	0	0	0	0	0	0	71417	1
145	1	718	363	346	48	0	0	45	3	0	0	0	3	0	0	0	0	37842	1
146	1	112	42	35	0	0	0	0	0	0	0	0	0	0	0	0	0	22800	1
147	1	266	151	140	0	0	0	0	0	0	0	0	0	0	0	2574	0	28633	1
148	1	245	103	103	48	0	18	15	0	0	0	15	0	0	0	0	0	37542	1
149	1	1299	686	616	103	0	103	0	0	0	0	0	0	0	0	0	0	19800	1
150	1	3	1	1	626	0	626	0	0	0	0	0	0	0	0	0	0	35800	1
151	1	6	3	3	111	48	15	10	3	35	0	0	38	0	0	0	0	46373	1
152	1	195	117	101	266	255	2	0	7	2	0	0	9	0	0	0	0	36925	1
153	1	1290	635	596	255	0	236	16	0	3	0	0	3	0	0	0	0	44615	1
154	1	105	82	74	0	0	0	0	0	0	0	0	0	0	0	0	0	43599	1
155	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31022	1
156	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30855	1
157	1	3	1	1	85	0	0	0	50	35	0	0	85	0	0	0	0	31855	1
158	1	14	6	4	392	6	132	15	21	218	0	0	239	0	0	0	0	51099	1
159	1	296	185	180	55	0	0	15	30	10	0	0	40	0	0	0	0	35427	1
160	1	0	0	0	1381	0	1193	0	175	13	0	0	188	0	0	0	0	46175	1
161	1	0	0	0	190	0	25	0	106	56	3	0	165	0	0	0	0	42800	1
162	1	644	377	283	276	0	7	237	10	15	7	0	32	0	655	0	0	30300	1
163	1	195	67	66	237	0	152	85	0	0	0	0	0	0	0	0	0	41732	1
164	1	9	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	73299	1
165	1	388	134	115	49	0	13	18	15	3	0	0	18	0	0	0	0	55453	1
166	1	32	13	13	35	0	0	15	7	10	0	3	17	0	0	0	0	37522	1
167	1	5	2	2	30	0	0	0	0	30	0	0	30	0	0	0	0	46855	1

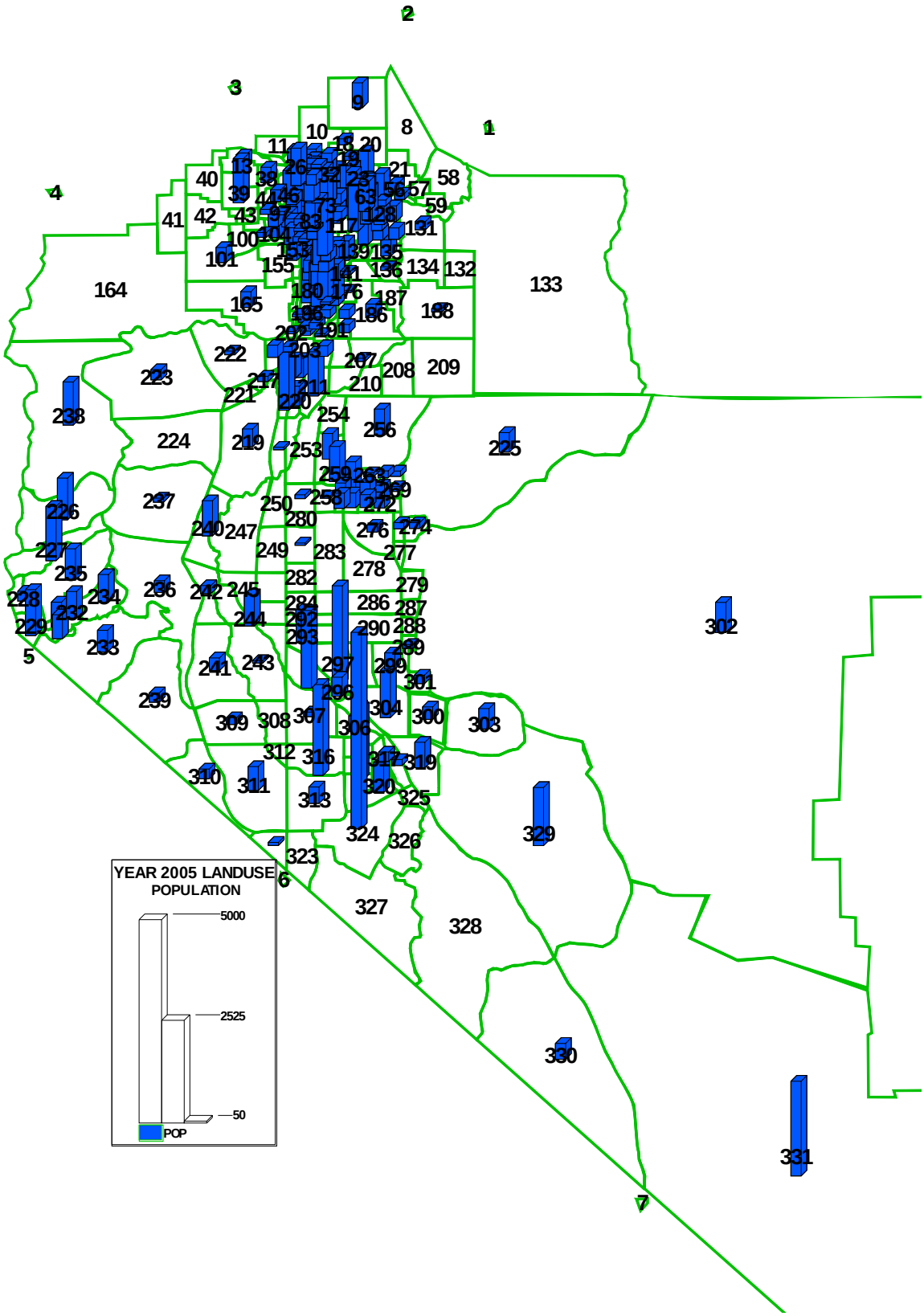
TAZ	DISTRICT	POP	DU	OCCDU	TOTEMP	HOTEL	OFFICE	INDUST	R_SHOP	C_SHOP	OTHER_RET	OTHER_NON	RETAIL	CASINO_SPGN	F18	F912	F13	MED_INC	JURIS_ID
168	1	2	1	1	232	0	0	7	115	110	0	0	225	0	0	0	0	37655	1
169	1	0	0	0	724	511	0	0	0	213	0	0	213	0	0	0	0	48605	1
170	1	71	44	39	35	0	0	0	0	35	0	0	35	0	0	0	0	54230	1
171	1	30	11	9	7	0	0	7	0	0	0	0	0	0	0	0	0	54522	1
172	1	286	119	117	218	22	191	5	0	0	0	0	0	0	0	0	0	31854	1
173	1	875	322	317	0	0	0	0	0	0	0	0	0	0	0	0	0	46154	1
174	1	708	259	254	94	0	80	14	0	0	0	0	0	0	0	0	0	52259	1
175	1	1135	394	390	10	0	0	10	0	0	0	0	0	0	1220	0	0	62425	1
176	1	54	26	25	6	0	0	6	0	0	0	0	0	0	0	0	0	121534	1
177	1	859	259	255	0	0	0	0	0	0	0	0	0	0	46	0	0	75342	1
178	1	860	333	329	9	0	3	6	0	0	0	0	0	0	0	0	0	45484	1
179	1	843	433	415	9	0	0	9	0	0	0	0	0	0	0	0	0	46166	1
180	1	1462	509	500	180	15	0	10	7	148	0	0	155	0	0	0	0	42152	1
181	1	0	0	0	524	0	76	150	118	180	0	0	298	0	0	0	0	25500	1
182	1	302	137	126	10	0	0	10	0	0	0	0	0	0	0	0	0	22591	1
183	1	63	23	23	0	0	0	0	0	0	0	0	0	0	0	0	0	48750	1
184	1	173	71	69	6	0	0	6	0	0	0	0	0	0	0	0	0	73756	1
185	1	26	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	124034	1
186	1	336	126	125	3	0	3	0	0	0	0	0	0	0	0	0	0	115534	1
187	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	129867	1
188	1	86	38	36	6	0	0	3	0	3	0	0	3	0	0	0	0	153211	1
189	1	217	90	89	3	0	0	3	0	0	0	0	0	0	0	0	0	133867	1
190	1	201	85	84	3	0	0	3	0	0	0	0	0	0	0	0	0	138034	1
191	1	31	12	12	0	0	0	0	0	0	0	0	0	0	0	0	0	44000	1
192	1	24	11	11	15	0	0	15	0	0	0	0	0	0	0	0	0	126534	1
193	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	129534	1
194	1	202	64	64	56	0	0	56	0	0	0	0	0	0	0	0	0	131867	1
195	1	189	88	88	7	0	0	7	0	0	0	0	0	0	0	0	0	36167	1
196	1	80	33	33	21	0	10	3	0	8	0	0	8	0	0	0	0	34300	1
197	1	258	122	115	48	0	0	0	13	35	0	0	48	0	0	0	0	35833	1
198	1	54	23	20	36	0	33	3	0	0	0	0	0	0	668	0	0	53750	1
199	1	154	51	50	3	0	0	3	0	0	0	0	0	0	0	0	0	53250	1
200	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46000	1
201	1	109	81	80	15	0	0	0	0	0	0	15	0	0	0	0	0	66050	1

TAZ	DISTRICT	POP	DU	OCCDU	TOTEMP	HOTEL	OFFICE	INDUST	R_SHOP	C_SHOP	OTHER_RET	OTHER_NON	RETAIL	CASINO_SPGN	F18	F912	F13	MED_INC	JURIS_ID
202	1	58	20	20	230	0	0	0	0	10	0	220	10	0	0	0	0	57605	1
203	2	33	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	129660	2
204	1	262	99	94	452	0	452	0	0	0	0	0	0	0	0	0	0	63900	1
205	1	76	32	29	15	0	15	0	0	0	0	0	0	0	0	0	0	59947	1
206	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88714	1
207	1	78	32	30	232	0	232	0	0	0	0	0	0	0	0	0	0	149443	1
208	1	26	11	11	0	0	0	0	0	0	0	0	0	0	0	0	0	158934	1
209	1	37	16	15	3	0	0	3	0	0	0	0	0	0	0	0	0	153684	1
210	1	0	0	0	0	0	0	0	0	0	0	0	0	0	160	0	0	155709	1
211	2	1082	430	412	21	0	18	3	0	0	0	0	0	0	0	0	0	93510	2
212	2	469	191	186	25	0	25	0	0	0	0	0	0	0	0	0	0	104110	2
213	2	498	203	194	250	0	0	18	22	210	0	0	232	0	0	0	0	84013	2
214	2	138	50	50	1159	0	3	5	404	747	0	0	1151	0	220	232	0	119482	2
215	2	553	240	229	156	0	3	3	0	150	0	0	150	0	0	0	0	135280	2
216	2	301	131	125	6	0	3	3	0	0	0	0	0	0	0	0	0	166106	2
217	2	133	49	49	88	0	82	6	0	0	0	0	0	0	0	0	0	230583	2
218	2	1441	525	506	4	0	1	3	0	0	0	0	0	0	0	0	0	84567	2
219	2	435	158	151	6	0	0	6	0	0	0	0	0	0	0	0	0	151260	2
220	2	484	230	208	0	0	0	0	0	0	0	0	0	0	0	0	0	98556	2
221	2	39	19	18	0	0	0	0	0	0	0	0	0	0	0	0	0	209833	2
222	2	91	37	35	45	0	45	0	0	0	0	0	0	0	0	0	0	167374	2
223	2	253	109	106	21	0	21	0	0	0	0	0	0	0	0	0	0	173842	2
224	2	6	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	228393	2
225	2	479	225	186	6	0	0	6	0	0	0	0	0	0	0	0	0	102738	2
226	2	1025	648	448	31	0	8	23	0	0	0	0	0	0	0	0	0	76109	2
227	2	1338	1176	637	31	0	3	22	0	0	0	6	0	0	0	0	0	53827	2
228	2	244	301	115	78	3	75	0	0	0	0	0	0	0	0	0	0	130263	2
229	2	1130	487	449	1456	1200	253	0	3	0	0	0	3	0	0	0	0	37343	2
230	2	589	304	242	545	30	288	67	77	55	6	22	138	0	0	0	0	88678	2
231	2	613	316	272	76	0	18	55	0	3	0	0	3	0	0	0	0	96678	2
232	2	654	347	270	30	0	9	18	3	0	0	0	3	0	459	0	0	83587	2
233	2	532	609	276	4883	4868	12	3	0	0	0	0	0	0	0	0	0	136922	2
234	2	686	398	293	10	0	0	3	0	0	7	0	7	0	0	0	0	127903	2
235	2	769	574	355	204	0	70	15	81	38	0	0	119	0	0	0	0	129146	2

TAZ	DISTRICT	POP	DU	OCCDU	TOTEMP	HOTEL	OFFICE	INDUST	R_SHOP	C_SHOP	OTHER_RET	OTHER_NON	RETAIL	CASINO_SPGN	F18	F912	F13	MED_INC	JURIS_ID
236	2	286	109	102	231	0	177	22	25	0	0	7	25	0	0	0	0	223346	2
237	2	102	48	42	0	0	0	0	0	0	0	0	0	0	0	0	0	220402	2
238	2	1060	1489	516	20	0	7	7	0	0	0	6	0	0	0	0	0	63080	2
239	2	230	106	100	9	0	9	0	0	0	0	0	0	0	0	0	0	252465	2
240	2	865	397	319	68	0	60	8	0	0	0	0	0	0	0	0	0	192171	2
241	2	314	133	120	6	0	3	3	0	0	0	0	0	0	0	0	0	234017	2
242	2	198	147	106	25	0	0	25	0	0	0	0	0	0	0	0	0	204152	2
243	2	63	25	23	45	0	45	0	0	0	0	0	0	0	0	0	0	214402	2
244	2	767	317	301	344	13	218	6	0	62	0	45	62	0	0	1553	0	54323	2
245	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54323	2
246	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	211402	2
247	2	39	25	21	0	0	0	0	0	0	0	0	0	0	0	0	0	168607	2
248	2	7	49	7	0	0	0	0	0	0	0	0	0	0	0	0	0	210402	2
249	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	210402	2
250	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	231556	2
251	2	64	26	22	12	0	0	0	0	4	0	8	4	0	0	0	0	140585	2
252	2	8	3	3	15	0	15	0	0	0	0	0	0	0	0	0	0	129710	2
253	2	44	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	116525	2
254	2	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	103858	2
255	2	633	241	235	21	0	0	21	0	0	0	0	0	0	0	0	0	115858	2
256	2	643	276	270	32	0	0	32	0	0	0	0	0	0	0	0	0	97220	2
257	2	95	39	39	16	0	3	10	0	3	0	0	3	0	0	0	0	131858	2
258	2	56	24	23	28	0	3	0	25	0	0	0	25	0	0	0	0	131858	2
259	2	865	298	294	13	3	0	10	0	0	0	0	0	0	0	0	0	122858	2
260	2	239	93	92	0	0	0	0	0	0	0	0	0	0	0	0	0	128858	2
261	2	375	140	138	3	0	3	0	0	0	0	0	0	0	0	0	0	131858	2
262	2	437	146	146	14	0	0	14	0	0	0	0	0	0	0	0	0	105220	2
263	2	96	34	33	3	0	0	3	0	0	0	0	0	0	0	0	0	97720	2
264	2	166	57	57	28	0	6	22	0	0	0	0	0	0	0	0	0	110488	2
265	2	134	45	45	18	0	0	18	0	0	0	0	0	0	0	0	0	103232	2
266	2	438	160	158	3	0	0	0	0	3	0	0	3	0	0	0	0	113311	2
267	2	251	93	91	78	0	78	0	0	0	0	0	0	0	0	0	0	118488	2
268	2	168	72	66	10	0	0	10	0	0	0	0	0	0	0	0	0	113488	2
269	2	120	49	46	6	3	0	3	0	0	0	0	0	0	0	0	0	102488	2

TAZ	DISTRICT	POP	DU	OCCDU	TOTEMP	HOTEL	OFFICE	INDUST	R_SHOP	C_SHOP	OTHER_RET	OTHER_NON	RETAIL	CASINO_SPGN	F18	F912	F13	MED_INC	JURIS_ID
270	2	362	141	139	21	0	3	15	0	3	0	0	3	0	0	0	0	131858	2
271	2	314	124	122	21	0	0	18	0	0	0	3	0	0	0	0	0	126488	2
272	2	391	139	134	18	0	3	15	0	0	0	0	0	0	0	0	0	136488	2
273	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136488	2
274	2	142	59	55	10	0	3	7	0	0	0	0	0	0	0	0	0	136027	2
275	2	153	59	57	0	0	0	0	0	0	0	0	0	0	415	0	0	247803	2
276	2	170	60	59	9	0	0	9	0	0	0	0	0	0	0	0	0	235803	2
277	2	23	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	61750	2
278	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	245803	2
279	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	245803	2
280	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	245803	2
281	2	57	25	24	12	0	5	7	0	0	0	0	0	0	0	0	0	230803	2
282	2	0	0	0	149	0	10	133	3	0	3	0	6	0	0	0	0	234803	2
283	2	49	22	22	1159	0	73	867	87	79	24	29	190	0	0	0	0	225803	2
284	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	225803	2
285	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	225803	2
286	2	6	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	245803	2
287	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	245803	2
288	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	67917	2
289	2	99	41	40	0	0	0	0	0	0	0	0	0	0	0	0	0	70000	2
290	2	37	16	15	148	0	0	90	0	0	58	0	58	0	0	0	0	248136	2
291	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	238803	2
292	2	295	142	136	48	0	0	45	0	0	0	3	0	0	0	0	0	236803	2
293	2	645	261	242	1303	557	576	3	0	152	15	0	167	0	467	0	0	229794	2
294	2	44	19	17	75	0	75	0	0	0	0	0	0	0	0	0	0	280803	2
295	2	1908	906	850	1600	0	853	197	6	531	0	13	537	0	0	0	0	58215	2
296	2	466	232	223	210	94	44	0	3	69	0	0	72	0	678	0	0	26801	2
297	2	2426	1140	1039	1570	23	949	66	0	532	0	0	532	0	845	0	705	195662	2
298	2	39	15	15	702	0	52	650	0	0	0	0	0	0	0	0	0	270136	2
299	2	397	152	144	46	0	3	43	0	0	0	0	0	0	0	0	0	261136	2
300	2	307	124	122	221	0	5	216	0	0	0	0	0	0	0	0	0	92861	2
301	2	208	75	72	3	0	3	0	0	0	0	0	0	0	0	0	0	86500	2
302	2	740	303	286	16	0	0	13	3	0	0	0	3	0	0	0	0	65397	2
303	2	504	222	218	28	0	9	19	0	0	0	0	0	0	0	0	0	78568	2

TAZ	DISTRICT	POP	DU	OCCDU	TOTEMP	HOTEL	OFFICE	INDUST	R_SHOP	C_SHOP	OTHER_RET	OTHER_NON	RETAIL	CASINO_SPGN	F18	F912	F13	MED_INC	JURIS_ID
304	2	1162	470	464	847	3	134	326	106	209	59	10	374	0	0	0	0	69807	2
305	2	66	22	11	84	0	40	3	18	23	0	0	41	0	0	0	0	98750	2
306	2	382	173	158	19	0	3	16	0	0	0	0	0	0	0	0	0	41996	2
307	2	113	44	42	13	0	0	13	0	0	0	0	0	0	0	0	0	216490	2
308	2	17	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	249652	2
309	2	166	71	68	20	7	0	13	0	0	0	0	0	0	0	0	0	248652	2
310	2	240	122	105	31	0	3	28	0	0	0	0	0	0	0	0	0	278637	2
311	2	591	255	242	31	0	10	21	0	0	0	0	0	0	0	0	0	270180	2
312	2	9	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	263402	2
313	2	406	134	124	172	0	43	93	30	0	3	3	33	0	0	0	0	197765	2
314	2	1303	455	442	20	0	7	10	0	0	0	3	0	0	0	0	0	46403	2
315	2	1775	626	616	111	0	75	33	0	0	3	0	3	0	0	0	0	49025	2
316	2	2235	906	873	45	0	0	45	0	0	0	0	0	0	0	0	0	91865	2
317	2	229	99	93	15	0	0	15	0	0	0	0	0	0	0	0	0	88172	2
318	2	147	96	79	0	0	0	0	0	0	0	0	0	0	0	0	0	108939	2
319	2	625	224	218	50	0	24	26	0	0	0	0	0	0	0	0	0	140346	2
320	2	735	275	267	24	0	3	7	0	0	0	14	0	0	0	0	0	117749	2
321	2	4826	1775	1732	183	0	159	21	0	0	0	3	0	0	0	0	0	110504	2
322	2	76	19	19	3	0	3	0	0	0	0	0	0	0	0	0	0	289902	2
323	2	17	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	231490	2
324	2	31	15	8	0	0	0	0	0	0	0	0	0	0	606	0	0	173896	2
325	2	33	14	13	0	0	0	0	0	0	0	0	0	0	0	0	0	133939	2
326	2	5	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	161233	2
327	2	11	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	234073	2
328	2	39	16	15	15	0	15	0	0	0	0	0	0	0	0	0	0	150697	2
329	2	1429	529	482	163	0	105	58	0	0	0	0	0	0	0	0	0	120920	2
330	2	389	167	157	16	0	3	13	0	0	0	0	0	0	494	0	0	33833	2
331	2	2331	1243	1061	150	150	0	0	0	0	0	0	0	0	960	0	0	38385	2
TOTAL		**109964**	**49342**	**44100**	**45622**	**9167**	**17493**	**8989**	**2123**	**6552**	**611**	**687**	**9286**	**0**	**10839**	**4359**	**3856**		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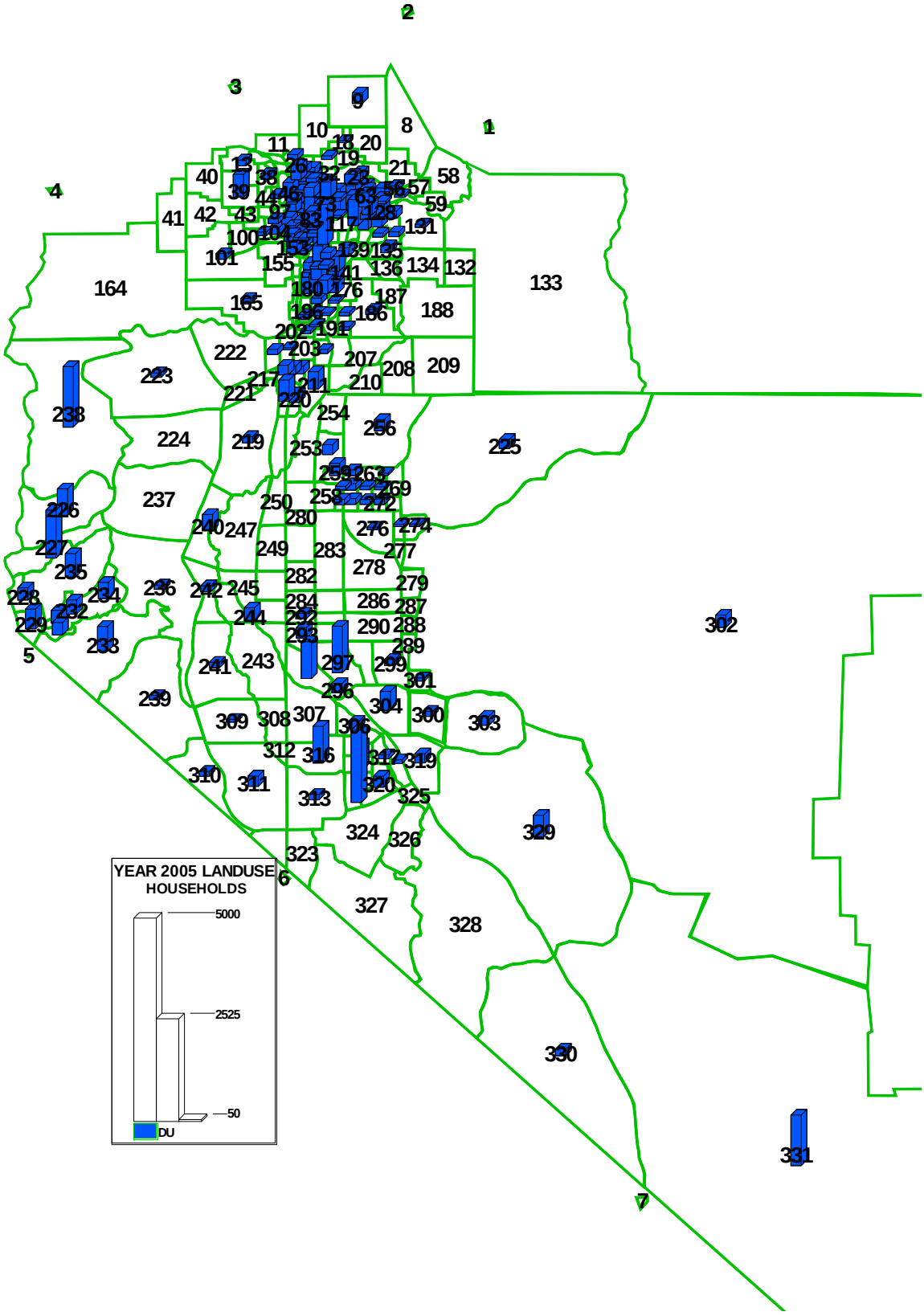
2525
50
POP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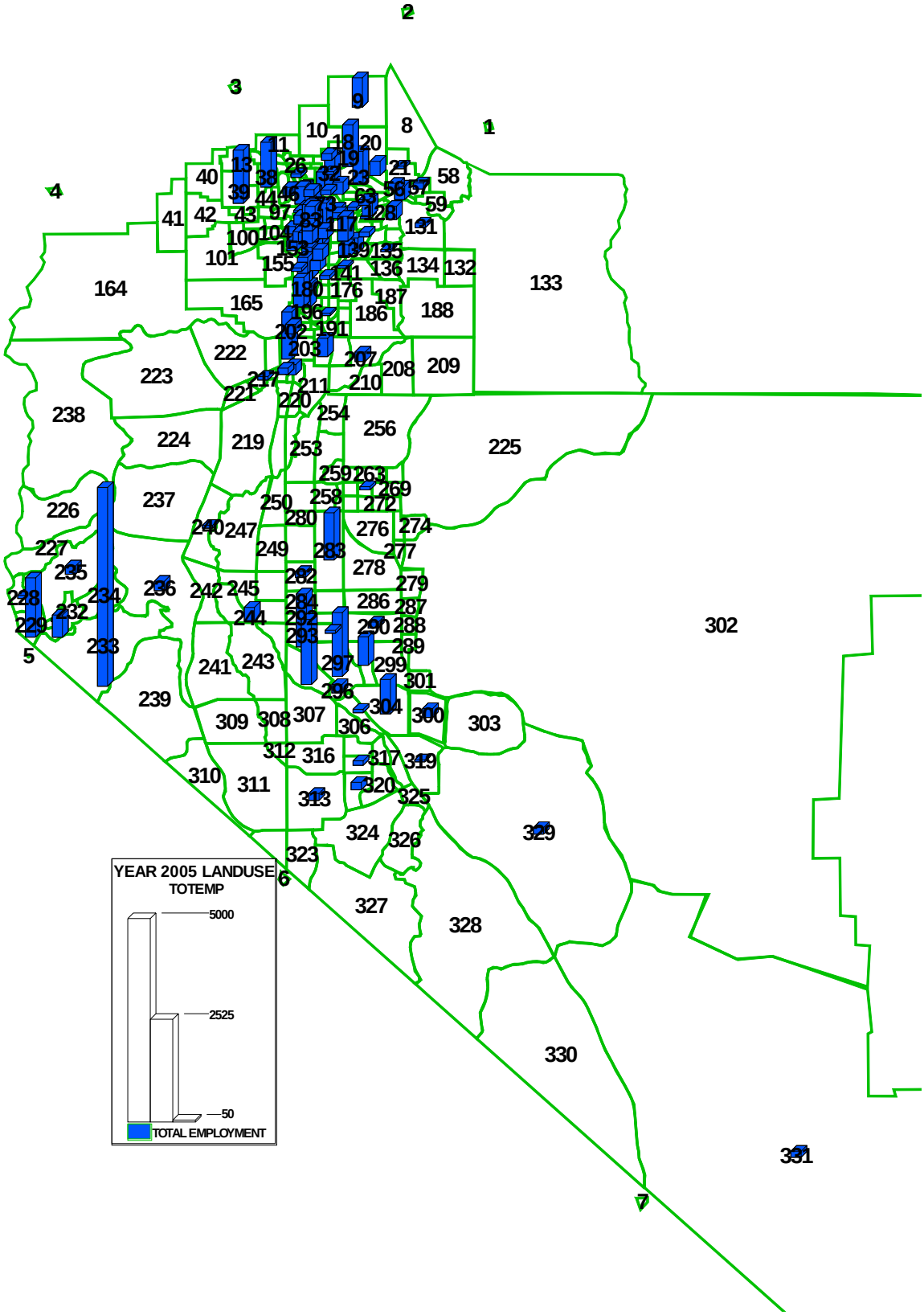
HOUSEHOLDS
5000
2525
50
DU


YEAR 2005 LANDUSE
TOTEMP
5000
2525
50
TOTAL EMPLOYMENT

Appendix C: Douglas County and Carson City Industries and Travel Demand Model, Employment by Category

NEVADA DETR CODE	NUMBER OF RECORDS	EMPLOYMENT	INDUSTRY	MODEL CATEGORY
512191	1	3	Teleproduction & Postproduction Ser	1
531311	7	42	Residential Property Managers	1
531312	3	25	Nonresidential Property Managers	1
0		9397	Hotel/Restaurant/Resort- Not Coded	1
211111	1	3		2
236220	27	207	Commercial Building Construction	2
323122	1	7	Prepress Services	2
425120	58	137	Wholesale Trade Agents and Brokers	2
484121	2	7	General Freight Trucking, Long-Dist	2
484122	1	0	General Freight Trucking, Long-Dist	2
511110	1	3	Newspaper Publishers	2
511120	1	15	Periodical Publishers	2
511130	1	0	Book Publishers	2
511140	1	0	Directory and Mailing List Publishe	2
516110	1	3	Internet Publishing and Broadcastin	2
517110	3	32	Wired Telecommunications Carriers	2
522110	3	29	Commercial Banking	2
522291	1	3	Consumer Lending	2
522292	6	31	Real Estate Credit	2
522298	1	3	All Other Nondeposit Credit Interme	2
522310	5	24	Mortgage and Nonmortgage Loan Broke	2
522320	1	0	Financial Transaction Process/Clear	2
523120	2	10	Securities Brokerage	2
523910	5	9	Miscellaneous Intermediation	2
523920	2	3	Portfolio Management	2
523930	3	9	Investment Advice	2
524126	1	0	Direct Property and Casualty Insure	2
524127	1	3	Direct Title Insurance Carriers	2
524210	6	27	Insurance Agencies and Brokerages	2
525920	1	0	Trusts, Estates, and Agency Account	2
531120	7	25	Lessors of Nonresidential Buildings	2
531190	2	6	Lessors of Other Real Estate Proper	2
531210	17	58	Offices of Real Estate Agents & Bro	2
531320	2	6	Offices of Real Estate Appraisers	2
532411	2	6	Transportation Equipment Rental/Lea	2
541110	12	68	Offices of Lawyers	2
541211	9	39	Offices of Certified Public Account	2

NEVADA DETR CODE	NUMBER OF RECORDS	EMPLOYMENT	INDUSTRY	MODEL CATEGORY
541213	1	0	Tax Preparation Services	2
541214	1	3	Payroll Services	2
541219	8	26	Other Accounting Services	2
541310	1	0	Architechtural Services	2
541320	4	24	Landscape Architechtural Services	2
541330	17	95	Engineering Services	2
541350	1	3	Building Inspection Services	2
541370	1	15	Other Surveying and Mapping Service	2
541410	2	3	Interior Design Services	2
541420	1	7	Industrial Design Services	2
541430	2	3	Graphic Design Services	2
541511	7	18	Custom Computer Programming Service	2
541512	3	13	Computer Systems Design Services	2
541519	8	18	Other Computer Related Services	2
611110	2	0	Elementary and Secondary Schools	2
611210	1	650	Junior Colleges	2
921120	1	0		2
921140	3	653	Executive & Legislative Offices Com	2
921150	1	7	Tribal Governments	2
922120	1	3	Police Protection	2
924120	2	10	Administration of Conservation Prog	2
926130	1	3	Utility Regulation and Administrati	2
0		19639	Office/Commercial- Not Coded	2
111219	1	15	Other Vegetable and Melon Farming	3
111940	2	14	Hay Farming	3
112111	1	15	Beef Cattle Ranching and Farming	3
112120	1	0	Dairy Cattle and Milk Production	3
112920	1	3	Horse and Other Equine Production	3
112990	1	3	All Other Animal Production	3
115210	3	6	Support Activities for Animal Produ	3
115310	1	0		3
212321	1	45	Construction Sand and Gravel Mining	3
221122	1	65	Electric Power Distribution	3
221210	1	150	Natural Gas Distribution	3
221310	4	28	Water Supply and Irrigation Systems	3
221320	1	15	Sewage Treatment Facilities	3
236115	95	634	New Single-Family Housing Construct	3
236116	1	0	New Multifamily Housing Constructio	3
236117	1	3	New Housing Operative Builders	3
236118	30	170	Residential Remodelers	3
237110	7	68	Water and Sewer System Construction	3

NEVADA DETR CODE	NUMBER OF RECORDS	EMPLOYMENT	INDUSTRY	MODEL CATEGORY
237130	4	50	Power/Communication System Construc	3
237210	4	12	Land Subdivision	3
237310	6	117	Highway, Street, and Bridge Constru	3
237990	1	3	Other Heavy Construction	3
238111	5	16	Residential Poured Foundation Contr	3
238112	3	18	Nonresidential Poured Foundation Co	3
238122	1	7	Nonresidential Structural Steel Con	3
238131	11	61	Residential Framing Contractors	3
238141	11	92	Residential Masonry Contractors	3
238142	3	33	Nonresidential Masonry Contractors	3
238151	7	38	Residential Glass/Glazing Contracto	3
238152	2	50	Nonresidential Glass/Glazing Contra	3
238161	13	92	Residential Roofing Contractors	3
238162	1	55	Nonresidential Roofing Contractors	3
238171	2	10	Residential Siding Contractors	3
238191	3	25	Other Residential Exterior Contract	3
238211	29	193	Residential Electrical Contractors	3
238212	15	131	Nonresidential Electrical Contracto	3
238221	24	238	Residential Plumbing/HVAC Contracto	3
238222	7	56	Nonresidential Plumbing/HVAC Contra	3
238291	2	10	Other Residential Equipment Contrac	3
238292	2	10	Other Nonresidential Equipment Cont	3
238311	5	122	Residential Drywall Contractors	3
238312	1	95	Nonresidential Drywall Contractors	3
238321	15	48	Residential Painting Contractors	3
238322	1	3	Nonresidential Painting Contractors	3
238331	1	0	Residential Flooring Contractors	3
238341	13	152	Residential Tile/Terrazzo Contracto	3
238342	1	3	Nonresidential Tile/Terrazzo Contra	3
238351	14	58	Residential Finish Carpentry Contra	3
238352	2	3	Nonresidential Finish Carpentry Con	3
238391	3	10	Other Residential Finishing Contrac	3
238392	1	0	Other Nonresidential Finishing Cont	3
238911	17	91	Residential Site Preparation Contra	3
238912	9	88	Nonresidential Site Preparation Con	3
238991	11	49	All Other Residential Trade Constra	3
238992	4	58	All Other Nonresidential Trade Cont	3
311230	1	3		3
311340	1	25	Nonchocolate Confectionery Manufact	3
311421	1	7	Fruit and Vegetable Canning	3
311612	1	35	Meat Processed from Carcasses	3

NEVADA DETR CODE	NUMBER OF RECORDS	EMPLOYMENT	INDUSTRY	MODEL CATEGORY
311821	1	3		3
311920	1	150		3
313222	1	0		3
314121	2	6	Curtain and Drapery Mills	3
314912	1	150	Canvas and Related Product Mills	3
314999	1	15	All Other Textile Product Mills	3
315211	1	3	Mens Cut and Sew Apparel Contractor	3
315999	1	7		3
316999	1	3	All Other Leather Good Manufacturin	3
321911	3	21	Wood Window and Door Manufacturing	3
321920	1	3	Wood Container and Pallet Manufactu	3
322231	1	3		3
322299	1	15	All Other Converted Paper Products	3
325510	1	150	Paint and Coating Manufacturing	3
325620	1	3	Toilet Preparation Manufacturing	3
325910	1	35	Printing Ink Manufacturing	3
325991	1	7	Custom Compounding of Purchased Res	3
326122	1	150	Plastics Pipe and Pipe Fitting Mfg	3
326199	6	78	All Other Plastics Product Manufact	3
326291	1	35		3
326299	1	3	All Other Rubber Product Manufactur	3
327113	1	15		3
327331	1	65	Concrete Block and Brick Manufactur	3
327390	1	55	Other Concrete Product Manufacturin	3
327991	1	3	Cut Stone & Stone Product Manufactu	3
327999	1	3	Misc Nonmetallic Mineral Products M	3
331491	1	3	Nonferrous, ex. Copper/Aluminum, Sh	3
331512	1	250		3
331522	1	3		3
332111	1	65		3
332116	1	35		3
332212	1	3	Hand and Edge Tool Manufacturing	3
332311	1	85	Prefabricated Metal Building & Comp	3
332312	1	3	Fabricated Structural Metal Mfg	3
332313	1	7	Plate Work Manufacturing	3
332710	21	156	Machine Shops	3
333511	2	6	Industrial Mold Manufacturing	3
333512	1	3		3
333515	2	22		3
333518	1	3		3
333611	2	7		3

NEVADA DETR CODE	NUMBER OF RECORDS	EMPLOYMENT	INDUSTRY	MODEL CATEGORY
333991	1	25		3
333993	1	3		3
333994	1	15		3
333996	1	7		3
334111	2	60	Electronic Computer Manufacturing	3
334119	1	15	Other Computer Peripheral Equipment	3
334220	2	18	Broadcast & Wireless Communication	3
334310	1	7	Audio and Visual Equipment Manufact	3
334412	2	14	Bare Printed Circuit Board Manufact	3
334414	2	165		3
334415	1	15		3
334418	5	113	Printed Circuit Assemblies	3
334419	1	15	Other Electronic Component Manufact	3
334511	1	3	Search, Detection & Navigation Inst	3
334513	8	858	Industrial Process Variable Instrum	3
334515	3	57	Electricity & Signal Testing Instru	3
334519	1	25	Other Measuring and Controlling Dev	3
335312	2	25	Motor and Generator Manufacturing	3
335313	1	45	Switchgear and Switchboard Apparatu	3
335314	2	14	Relay & Industrial Control Manufact	3
335921	1	7		3
335931	1	150	Current-Carrying Wiring Device Mfg	3
336311	2	185	Carburetors, Pistons, Rings, and Va	3
336312	3	73	Gasoline Engines and Engine Parts	3
336321	1	7		3
336322	1	150	Other Motor Vehicle Electrical Equi	3
336330	1	20	Motor Vehicle Steering/Suspension P	3
336399	1	45	All Other Motor Vehicle Parts Mfg	3
336412	2	435		3
336413	1	35	Other Aircraft Parts and Equipment	3
336510	1	35		3
336612	1	25		3
336991	1	35	Motorcycle, Bicycle, and Parts Mfg	3
336999	1	3	All Other Transportation Equipment	3
337110	7	37	Wood Kitchen Cabinets and Counterto	3
337122	1	3	Nonupholstered Wood Household Furni	3
337125	1	0		3
337215	2	3	Showcases, Partition, Shelving & Lo	3
337910	1	45	Mattress Manufacturing	3
339112	1	3	Surgical and Medical Instrument Mfg	3
339113	2	10	Surgical Appliance and Supplies Mfg	3

NEVADA DETR CODE	NUMBER OF RECORDS	EMPLOYMENT	INDUSTRY	MODEL CATEGORY
339114	1	15	Dental Equipment and Supplies Mfg	3
339911	1	3	Jewelry (except Costume) Manufactur	3
339920	2	10	Sporting & Athletic Goods Manufactu	3
339950	6	40	Sign Manufacturing	3
339999	4	10	All Other Miscellaneous Manufacturi	3
454311	1	3		3
0		9899	Industrial- Not Coded	3
311812	3	50	Commercial Bakeries	4
423860	2	6	Other Transport Goods Merchant Whsl	4
441310	6	42	Automotive Parts and Accessories St	4
441320	5	63	Tire Dealers	4
442210	5	51	Floor Covering Stores	4
442291	1	3	Window Treatment Stores	4
442299	5	61	All Other Home Furnishings Stores	4
443111	2	22	Household Appliance Stores	4
443112	9	204	Radio, TV & Other Electronics Store	4
443120	3	6	Computer and Software Stores	4
444110	1	150	Home Centers	4
444120	2	22	Paint and Wallpaper Stores	4
444130	2	22	Hardware Stores	4
444190	15	230	Other Building Material Dealers	4
444210	1	3	Outdoor Power Equipment Stores	4
444220	3	57	Nursery, Garden & Farm Supply Store	4
445110	6	360	Supermarkets and Other Grocery Stor	4
445120	4	13	Convenience Stores	4
445291	1	15	Baked Goods Stores	4
445292	1	3	Confectionery and Nut Stores	4
445310	5	32	Beer, Wine, and Liquor Stores	4
446110	7	135	Pharmacies and Drug Stores	4
446120	1	7	Cosmetic and Beauty Supply Stores	4
446130	1	3	Optical Goods Stores	4
446191	2	10	Food (Health) Supplement Stores	4
447110	17	154	Gasoline Stations w/ Convenience St	4
447190	2	22	Other Gasoline Stations	4
448110	1	3	Men's Clothing Stores	4
448120	2	10	Women's Clothing Stores	4
448140	4	80	Family Clothing Stores	4
448150	3	9	Clothing Accessories Stores	4
448190	1	3	Other Clothing Stores	4
448210	5	20	Shoe Stores	4
448310	6	19	Jewelry Stores	4
451110	2	40	Sporting Goods Stores	4

NEVADA DETR CODE	NUMBER OF RECORDS	EMPLOYMENT	INDUSTRY	MODEL CATEGORY
451120	2	42	Hobby, Toy, and Game Stores	4
451211	1	35	Book Stores	4
452990	1	25	All Other General Merchandise Store	4
453220	2	6	Gift, Novelty, and Souvenir Stores	4
453910	3	33	Pet and Pet Supplies Stores	4
453920	2	0	Art Dealers	4
453991	1	7	Tobacco Stores	4
454111	2	7	Electronic Shopping	4
532230	2	6	Video Tape and Disc Rental	4
923140	1	3		4
0		6726	Retail-Shopping- Not Coded	4
423110	1	3	Motor Vehicle Merchant Wholesalers	5
423120	3	182	New Motor Vehicle Part Merchant Whs	5
423390	1	3	Other Construction Supply Merchant	5
423420	1	55	Office Equipment Merchant Wholesale	5
423430	2	7	Computer and Supply Merchant Wholes	5
423450	5	9	Medical Equipment Merchant Wholesal	5
423610	3	13	Wiring & Equipment Merchant Wholesa	5
423690	1	3	Other Electronic Parts Merchant Whs	5
423710	3	45	Hardware Merchant Wholesalers	5
423720	4	24	Plumbing Goods Merchant Wholesalers	5
423820	1	15	Farm & Garden Equip Merchant Wholes	5
423830	7	58	Industrial Machinery Merchant Whsle	5
423840	1	7	Industrial Supplies Merchant Wholes	5
423910	1	3	Sporting Good Merchant Wholesalers	5
423920	2	3	Toy and Hobby Goods Merchant Wholes	5
423990	7	28	All Other Durable Goods Merchant Wh	5
424210	3	22	Druggists' Goods Merchant Wholesale	5
424420	1	7	Packaged Frozen Food Merchant Whsle	5
424450	2	6	Confectionery Merchant Wholesalers	5
424490	4	20	Other Grocery Product Merchant Whsl	5
424590	1	0	Other Farm Product Raw Material Mer	5
424690	3	6	Other Chemical Merchant Wholesalers	5
424720	1	15	Other Petroleum Merchant Wholesaler	5
424810	1	45	Beer and Ale Merchant Wholesalers	5
424820	1	0	Wine and Spirit Merchant Wholesaler	5
424910	1	0	Farm Supplies Merchant Wholesalers	5

NEVADA DETR CODE	NUMBER OF RECORDS	EMPLOYMENT	INDUSTRY	MODEL CATEGORY
424920	1	3	Book & Periodical Merchant Wholesal	5
424930	1	3	Nursery & Florist Merchant Wholesal	5
424950	1	3	Paint & Supplies Merchant Wholesale	5
424990	2	3	Other Nondurable Goods Merchant Whs	5
441110	9	483	New Car Dealers	5
441120	1	3	Used Car Dealers	5
441210	2	60	Recreational Vehicle Dealers	5
441221	4	60	Motorcycle Dealers	5
441229	1	3	All Other Motor Vehicle Dealers	5
453930	1	3	Manufactured (Mobile) Home Dealers	5
493110	1	3	General Warehousing and Storage	5
517510	2	60	Cable and Other Program Distributio	5
532412	1	7	Other Heavy Machinery Rental and Le	5
0		1930	Retail-Commercial- Not Coded	5
323110	6	22	Commercial Lithographic Printing	6
323112	1	3	Commercial Flexographic Printing	6
323113	1	7	Commercial Screen Printing	6
323114	6	26	Quick Printing	6
323119	1	3	Other Commercial Printing	6
332721	1	15	Precision Turned Product Manufactur	6
332722	1	150	Bolts, Nuts, Screws, Rivets, and Wa	6
332812	2	7	Metal Coating and Nonprecious Engra	6
332813	1	15	Electroplating/Anodizing/Coloring M	6
332912	1	55	Fluid Power Valves and Hose Fitting	6
332999	2	32	Miscellaneous Fabricated Metal Prod	6
333319	1	0	Other Commercial and Service Machin	6
333514	2	40	Special Tools, Dies, Jigs, and Fixt	6
333999	2	18	Miscellaneous General Purpose Machi	6
454390	1	3	Other Direct Selling Establishments	6
531130	6	44	Miniwarehouses and Self-Storage Uni	6
532111	2	0	Passenger Car Rental	6
532490	1	15	Other Machinery Rental and Leasing	6
0		669	Retail-other- Not Coded	6
114111	1	0		7
339116	2	6	Dental Laboratories	7
425110	1	15	Business to Business Electronic Mar	7
481211	2	10	Nonscheduled Air Passenger Charteri	7
481212	3	10	Nonscheduled Air Freight Chartering	7
484210	1	0	Used Household and Office Goods Mov	7
484220	5	16	Other Specialized Trucking, Local	7
485320	1	3	Limosine Service	7

NEVADA DETR CODE	NUMBER OF RECORDS	EMPLOYMENT	INDUSTRY	MODEL CATEGORY
488190	4	12	Other Support Activities, Air Trans	7
488410	1	0	Motor Vehicle Towing	7
488490	1	3	Other Support Activities, Road Tran	7
492210	1	0	Local Messengers and Local Delivery	7
512110	1	0	Motion Picture and Video Production	7
515210	1	0	Cable and Other Subscription Progra	7
531110	7	35	Lessors of Residential Buildings	7
531390	1	3	Other Activities Related to Real Es	7
541611	5	3	Administrative Management Consultin	7
622110	1	150	General Medical and Surgical Hospit	7
624190	1	0	Other Individual and Family Service	7
624210	1	7	Community Food Services	7
624410	2	22	Child Day Care Services	7
713940	1	3	Fitness and Recreational Sports Cen	7
921130	1	65	Public Finance Activities	7
0		490	Non-Retail- Not Coded	7