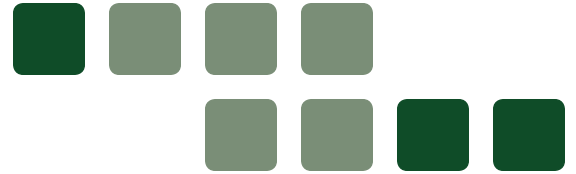
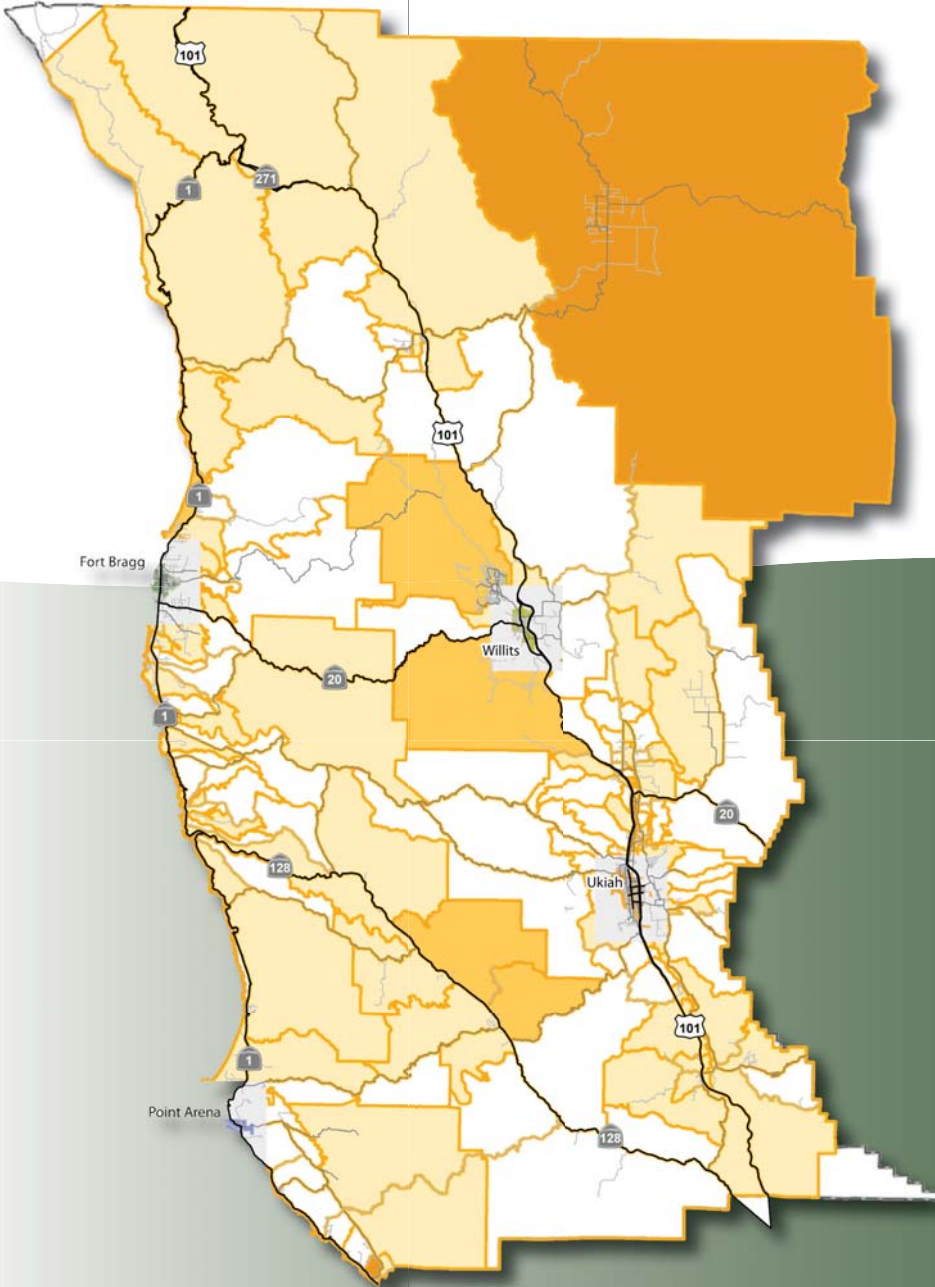




Final Model Development Report  
MCOG TRAVEL DEMAND FORECASTING MODEL



Prepared by:

Fehr & Peers

October 2010



FEHR & PEERS  
TRANSPORTATION CONSULTANTS  
WC09-2631

## TABLE OF CONTENTS

<b>1. Introduction.....</b>	<b>1</b>
Background.....	1
Model Overview.....	1
Model Area and Periods Covered by the Model.....	1
Organization of this Report.....	2
<b>2. Input Data and Model Parameters.....</b>	<b>4</b>
TAZ System.....	4
Land Use Data.....	4
Trip Generation Rates.....	19
Trip Purposes.....	21
Roadway Network.....	21
Friction Factors.....	28
External Travel Characteristics.....	28
Peak Hour Model.....	28
<b>3. Summary of Model Validation.....</b>	<b>29</b>
Static Validation.....	29
Validation Comparison Techniques.....	29
Static Validation Standards.....	29
Static Validation Results.....	31
Dynamic Validation.....	36
<b>4. Future Year Model.....</b>	<b>41</b>
Future Land Use Files.....	41
Future Roadway Networks.....	41
External Travel Characteristics.....	41
Forecasts.....	42
<b>5. Model Limitations.....</b>	<b>63</b>
Production and Attraction Balancing.....	63
Sensitivity to the Built Environment.....	63
Local Residential Trip Generation Rates and Dwelling Unit Occupancy.....	63

## **APPENDICES**

APPENDIX A – FREQUENTLY ASKED QUESTIONS ABOUT TRAVEL DEMAND MODELS

APPENDIX B – BASE YEAR LAND USE DATA

APPENDIX C – TRIP GENERATION RATES

APPENDIX D – BASE YEAR VALIDATION RESULTS

APPENDIX E – HOURLY FACTORS

APPENDIX F – FUTURE YEAR LAND USE DATA

APPENDIX G – THROUGH TRIP MATRICES

APPENDIX H – COMPONENTS OF THE MODEL

## LIST OF FIGURES

Figure 1 – Model Area.....	3
Figure 2 – Traffic Analysis Zones Map Key .....	6
Figure 2a – Traffic Analysis Zones Inset A .....	7
Figure 2a.1 – Traffic Analysis Zones Inset A.1 (Fort Bragg).....	8
Figure 2b – Traffic Analysis Zones Inset B .....	9
Figure 2b.1 – Traffic Analysis Zones Willits .....	10
Figure 2c – Traffic Analysis Zones Inset C .....	11
Figure 2e – Traffic Analysis Zones Inset D .....	12
Figure 2e – Traffic Analysis Zones Inset E .....	13
Figure 2f – Traffic Analysis Zones Inset F .....	14
Figure 2f.1 – Traffic Analysis Zones Inset F.1 (Ukiah).....	15
Figure 2g – Traffic Analysis Zones Inset G.....	16
Figure 2h – Traffic Analysis Zones Inset H.....	17
Figure 2i – Traffic Analysis Zones Inset I.....	18
Figure 3 – Road Functional Classification Map .....	23
Figure 3a – Road Functional Classification Map Inset (Fort Bragg) .....	24
Figure 3b – Road Functional Classification Map Inset (Willits).....	25
Figure 3c – Road Functional Classification Map Inset (Point Arena) .....	26
Figure 3d – Road Functional Classification Map Inset (Ukiah).....	27
Figure 4 – PRMSE Examples .....	30
Figure 5 – Model Screenlines .....	32
Figure 5a – Model Screenlines Inset (Fort Bragg) .....	33
Figure 5b – Model Screenlines Inset (Willits).....	34
Figure 5c – Model Screenlines Inset (Ukiah) .....	35
Figure 6 – Change in Vehicle Trips with 10 Additional Single Family Homes .....	36
Figure 7 – Dynamic Validation of Changes in Dwelling Units.....	37
Figure 8 – Change in Vehicle Trips with 10 Additional Retail Employees .....	38
Figure 9 – Dynamic Validation of Changes in Retail Employees.....	39



Figure 10 – MCOG Model 2030 Residential Growth .....	43
Figure 10a – MCOG Model 2030 Residential Growth Inset (Fort Bragg) .....	44
Figure 10b – MCOG Model 2030 Residential Growth Inset (Willits).....	45
Figure 10c – MCOG Model 2030 Residential Growth Inset (Point Arena) .....	46
Figure 10d – MCOG Model 2030 Residential Growth Inset (Ukiah).....	47
Figure 11 – MCOG Model 2030 Employment Growth .....	48
Figure 11a – MCOG Model 2030 Employment Growth Inset (Fort Bragg).....	49
Figure 11b – MCOG Model 2030 Employment Growth Inset (Willits) .....	50
Figure 11c – MCOG Model 2030 Employment Growth Inset (Point Arena) .....	51
Figure 11d – MCOG Model 2030 Employment Growth Inset (Ukiah).....	52
Figure 12 – 2009 Model Volumes and Volume/Capacity Ratios for Mendocino County .....	53
Figure 12a – 2009 Model Volumes and Volume/Capacity Ratios for Mendocino County Inset (Fort Bragg) .....	54
Figure 12b – 2009 Model Volumes and Volume/Capacity Ratios for Mendocino County Inset (Willits) .....	55
Figure 12c – 2009 Model Volumes and Volume/Capacity Ratios for Mendocino County Inset (Point Arena).....	56
Figure 12d – 2009 Model Volumes and Volume/Capacity Ratios for Mendocino County Inset (Ukiah) .....	57
Figure 13 – 2030 Model Volumes and Volume/Capacity Ratios for Mendocino County .....	58
Figure 13a – 2030 Model Volumes and Volume/Capacity Ratios for Mendocino County Inset (Fort Bragg) .....	59
Figure 13b – 2030 Model Volumes and Volume/Capacity Ratios for Mendocino County Inset (Willits) .....	60
Figure 13c – 2030 Model Volumes and Volume/Capacity Ratios for Mendocino County Inset (Point Arena).....	61
Figure 13d – 2030 Model Volumes and Volume/Capacity Ratios for Mendocino County Inset (Ukiah) .....	62

## LIST OF TABLES

Table 1 – Land Use Definitions .....	19
Table 2a – Trip Generation Rates For Residential Uses .....	20
Table 2b – Trip Generation Rates For Non-Residential Uses .....	20
Table 3 – Road Capacity By Functional Classification .....	22
Table 4 – Static Validation Results for Screenlines .....	31
Table 5 – Static Validation Results for Link Level.....	31
Table 6 – Dynamic Validation of Removal of a Link in Road Network .....	40
Table 7 – Dynamic Validation of Addition of a Link in Road Network.....	40
Table 8 – Roadway Improvements Included in the Future Models.....	42

# 1. INTRODUCTION

## BACKGROUND

The purpose of this project was to develop a comprehensive travel demand forecasting (TDF) model for Mendocino County with outputs for the 2010 Base Year, an Intermediate Year (2020), and Long Term (2030). The model will be used for transportation planning activities within Mendocino County, such as developing Capital Improvement Programs (CIPs) and the Regional Transportation Plan (RTP).

This report documents the development of the TDF model for Mendocino County, which was prepared using the TransCAD Transportation GIS software. As part of this effort, key model inputs such as land use, road network and trip generation parameters were developed and the model was validated to year 2009 conditions. Prior to this project, the only TDF model in Mendocino County was a Ukiah Valley Area model, originally developed in 2003 by OmniMeans, and modified by Fehr & Peers in 2008. This is the first countywide TDF model.

This report describes the development of the existing conditions model, presents the validation results (which measure the model's accuracy against observed transportation data), summarizes the assumptions included in the future year model, and explains the model's functions and limitations.

Transportation planning in Mendocino County is the responsibility of the Mendocino Council of Governments (MCOG), which is the designated Regional Transportation Planning Agency (RTPA). MCOG is a Joint Powers Agency comprised of the County of Mendocino, and the cities of Fort Bragg, Point Arena, Ukiah, and Willits. The TDF model developed as a result of this effort will be referred to as the "MCOG Model" throughout this report.

## MODEL OVERVIEW

The MCOG Model is a three-step model consisting of Trip Generation, Trip Distribution, and Trip Assignment. Traditional urban travel models also include a step called Mode Choice, which occurs between Trip Distribution and Trip Assignment and is primarily used to determine the number of trips that are made by public transit as compared to private automobiles. A Mode Choice component was not included in the MCOG model process because the extensive data collection and calibration effort required was beyond the scope of this project and it was not felt to be critically important because automobiles are the dominant mode of transportation in Mendocino County (for example, US Census data indicate that public transit is used for less than one percent of commute trips).

A unique enhancement included but not yet enabled in the MCOG TDF model is a 3Ds feature. This feature maybe enabled as part of a future model update. The 3Ds feature adjusts the Trip Generation component of the model to reflect the vehicle travel effects of land use Density, land use Diversity, and access to regional Destinations; for instance, developments that include a mix of land uses at densities that are higher than typical for that area have been found to result in somewhat lower vehicle trip generation rates. Accounting for the effects of smart growth/sustainable growth is an increasingly important feature for TDF models to include. The latest update to the California Transportation Commission's RTP guidelines encourages RTPAs like MCOG to enhance their TDF models with features like the 3D component. Moreover, the greenhouse gas analysis required by AB 32 also is more reliable when the model is sensitive to changes in land uses that can be quantified by the 3Ds.

## MODEL AREA AND PERIODS COVERED BY THE MODEL

The model area for the MCOG TDF Model encompasses all of Mendocino County, which includes the cities of Ukiah, Fort Bragg, Willits and Point Arena. Figure 1 shows the MCOG TDF model area. (Figure 1 also shows the geographical distinction between trip generation areas, which are discussed in section 3 of this report.) To represent travel into and out of Mendocino County, the model also includes five "external gateways" at major roads that cross the county line: SR 1, SR 128 and US 101 on the south, SR 20 on the east, and US 101 on the north.

The network file includes nearly every road in the model area, which allows users to orient themselves to locations in the network. It also provides a good starting point when users add detail to the model as part of individual studies.

The major data inputs to the base year model, such as the land use data and traffic count data, are generally representative of conditions as of 2009. Therefore, 2009 was selected as the Base Year for the MCOG TDF model.

The TDF model produces traffic forecasts for daily, AM peak hour, and PM peak hour conditions. The TDF model is calibrated to traffic counts for what is conventionally termed a “typical weekday,” which is defined as a Tuesday, Wednesday, or Thursday during a week with no holidays and when local schools are in session.

In addition to the 2009 version of the TDF model, future year 2020 and 2030 versions of the model were developed. As described later in this report, the 2020 and 2030 versions of the model are based on the 2009 model structure, but include new land use inputs, roadway network files, and other updated information necessary to enable forecasting to 2020 or 2030 conditions.

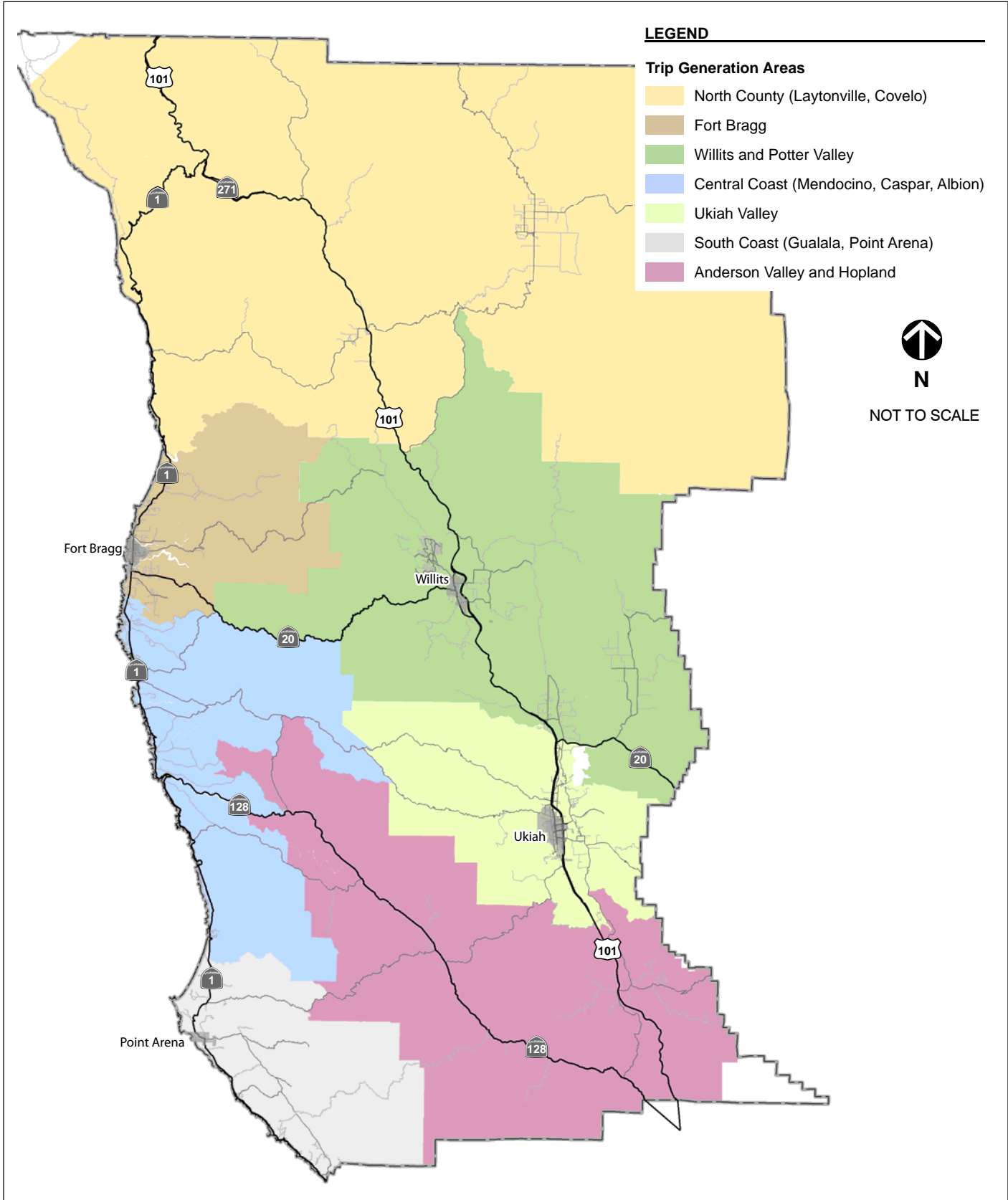
## **ORGANIZATION OF THIS REPORT**

This report is organized into the following sections.

- Section 1 – Introduction
- Section 2 – Summary of the Input Data
- Section 3 – Summary of the Model Validation
- Section 4 – Future Year Model
- Section 5 – Model Limitations

A technical appendix is also attached, which contains model development information that is referenced in the report. The appendices are listed below.

- Appendix A – Frequently Asked Questions About Computerized Traffic Models
- Appendix B – Base Year Land Use Data
- Appendix C – Trip Generation Rates
- Appendix D – Base Year Validation Results
- Appendix E – Hourly Factors
- Appendix F – Future Year Land Use Data
- Appendix G – Through Trip Matrices
- Appendix H – Components of the Model



## 2. INPUT DATA AND MODEL PARAMETERS

As described in the previous chapter, the MCOG TDF model incorporates many types of input data, which are further described in this chapter. Note that Appendix H contains a detailed outline of all of the model files, including specific filenames and a description of the type of information each file contains.

### TAZ SYSTEM

The MCOG TDF model area is divided into geographic sub-areas called TAZs, which are used to aggregate land use and other demand-related information. TAZ boundaries are typically drawn along natural or human-made barriers, and are used to cluster together land uses that have similar access to the road system. The MCOG model area was divided into a total of 604 TAZs; the boundaries were developed by Mendocino County staff, with assistance from the consultant team. Please note that the TAZs are not numbered sequentially; although there are 604 TAZs in the model, the numbering goes as high as 942. This does not affect the model's outcome. The TAZ structure within the Ukiah Valley area is consistent with the earlier Ukiah Valley model.

Figure 2 and insets 2a-2i show maps of the TAZ system.

### LAND USE DATA

One of the primary inputs to the TDF model is the land use data. These data were used in estimating trip generation. Land use data for the model was obtained from two sources:

1. For residential land uses and schools, the County's parcel database was aggregated into the model land use categories. The parcel database was verified with the cities, towns, and County's existing land use, general plan, and zoning information, where available, along with 2009 aerial photos and field observations. School enrollment was obtained from school Web sites.
2. For nonresidential uses, job data were obtained from a January 2010 InfoUSA employment database, purchased by the developers of the Wine Country Regional Model (currently under development to cover Napa, Sonoma, Mendocino and Lake Counties). Data for the largest employers in Mendocino County were thoroughly checked by County staff, and in many cases refined with more accurate numbers and/or locations.

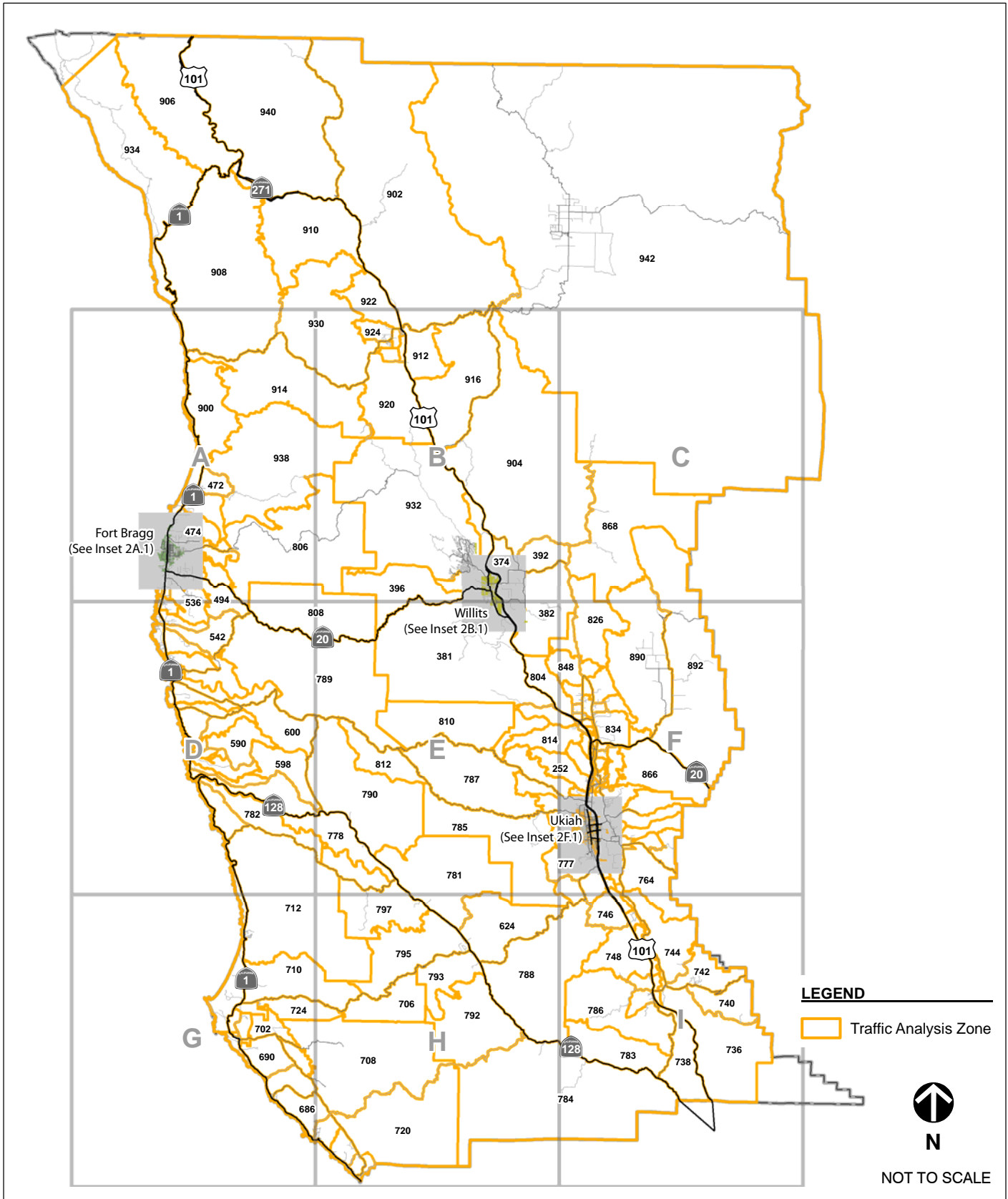
In addition, Fehr & Peers made some modifications to the land use data to aid in the base year validation process:

1. 2000 census data on numbers of residential units in each city and unincorporated area within the County suggested that the initial housing estimates were overstated by about 25 percent in the regions along the coast south of Fort Bragg and within Anderson Valley. As a result, the model was producing too much traffic along SR 1 south of Fort Bragg, as well as SR 128 and SR 253. By reducing the number of residential units by 25% in these areas, the model's vehicle volumes on these facilities became more consistent with traffic counts.
2. At several locations in Ukiah, the InfoUSA data did not appear to accurately identify the levels of employment. These locations were concentrated on the North State Street corridor between US 101 and Lake Mendocino Drive, and on the South State Street corridor between Talmage Road and US 101. Initially, traffic volumes on North and South State Street were being significantly underestimated by the model. Increasing the numbers of jobs in the proximity of these areas brought the model's traffic volumes to more reasonable levels.
3. Because of the wide variation observed in these general categories, both the Retail and the Entertainment categories were divided into sub-categories, as follows:

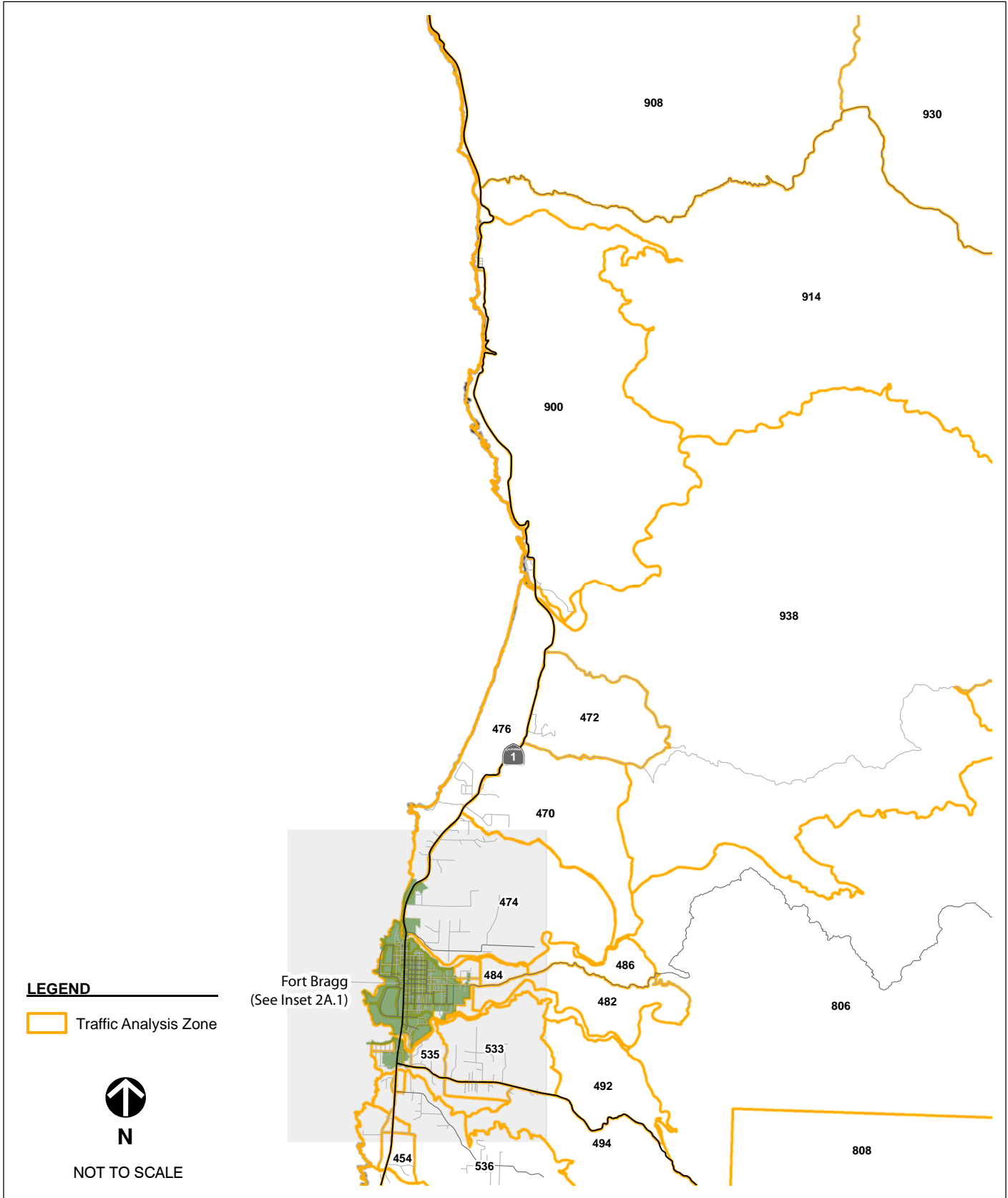
- a. High-generating retail uses are defined as large commercial operations such as grocery stores, or a major retailer such as Walmart
- b. Medium-generating retail uses are defined as a more general retail use, ranging from small clothing stores to post offices
- c. Low-generating retail uses are defined as more specialized retail, such as art galleries or automobile repair shops
- d. High-generating entertainment uses are defined as tourist-related land uses, such as resorts and casinos, or popular local attractions such as health clubs
- e. Low-generating entertainment uses are defined as businesses where the trip generation largely occurs during weekends (and therefore does not substantially affect the typical weekday conditions that are the subject of this model), such as music and live entertainment facilities

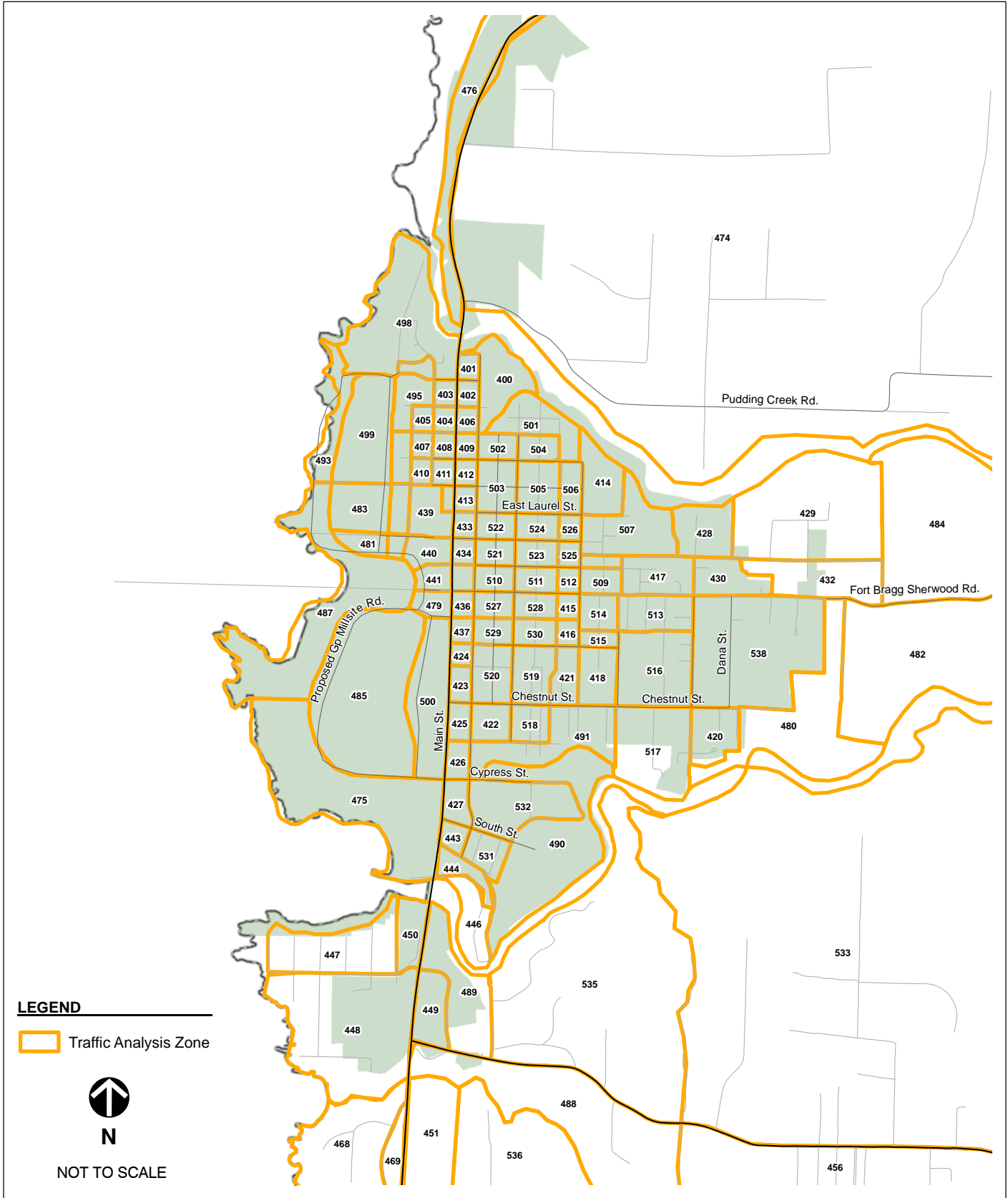
Appendix B contains the model land use by TAZ for the base year (2009).

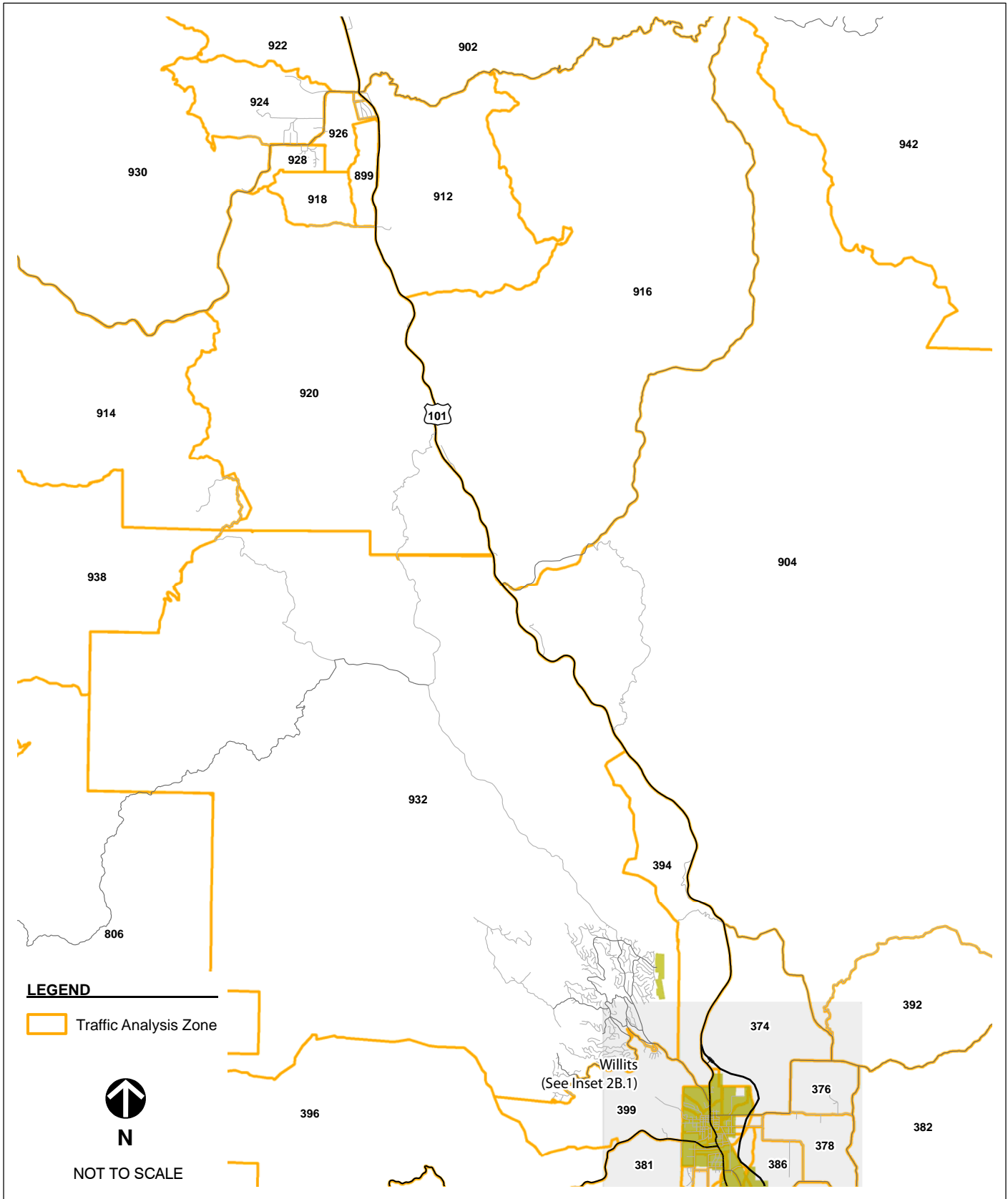
Table 1 shows the definitions of the model's land use categories.

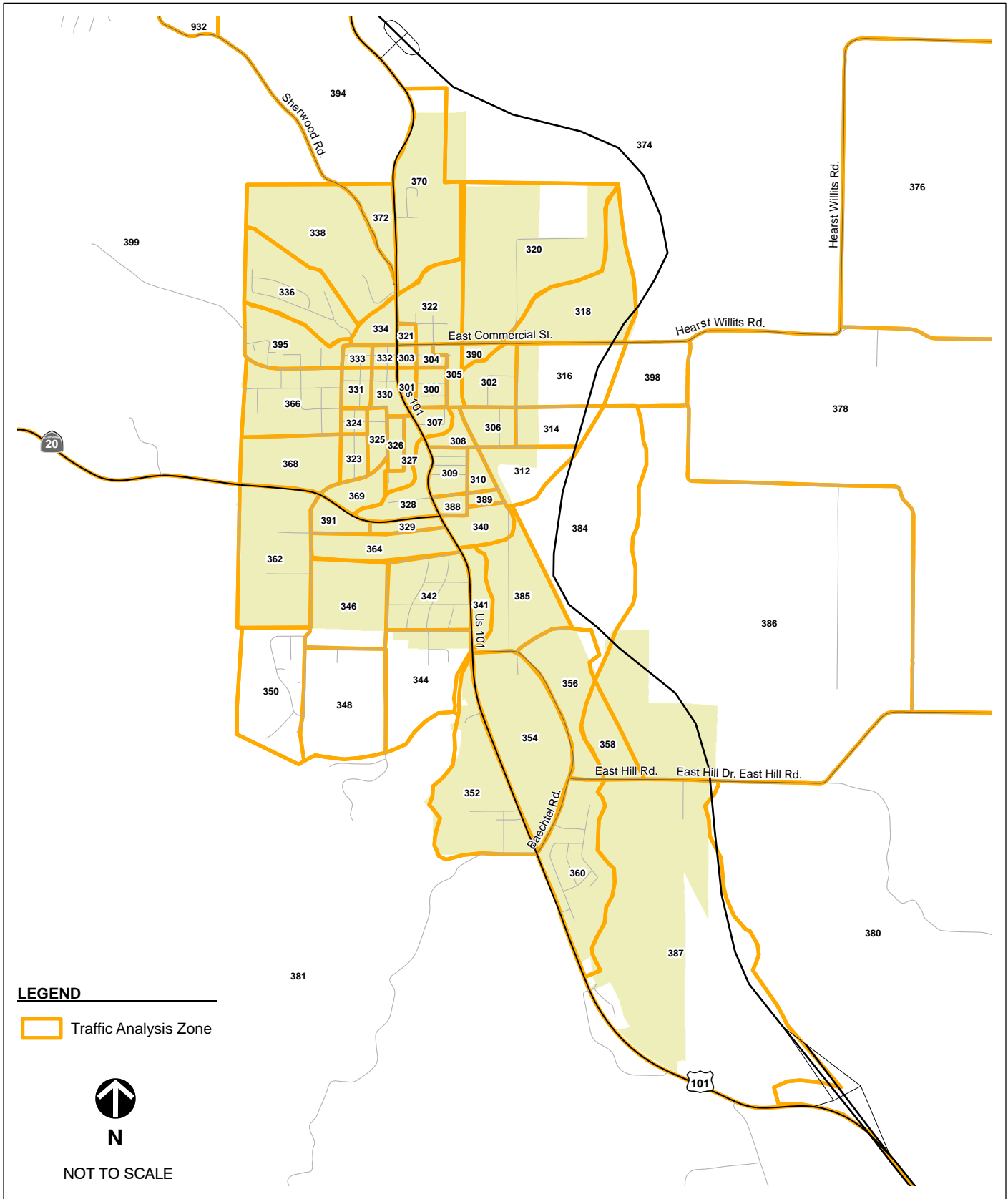


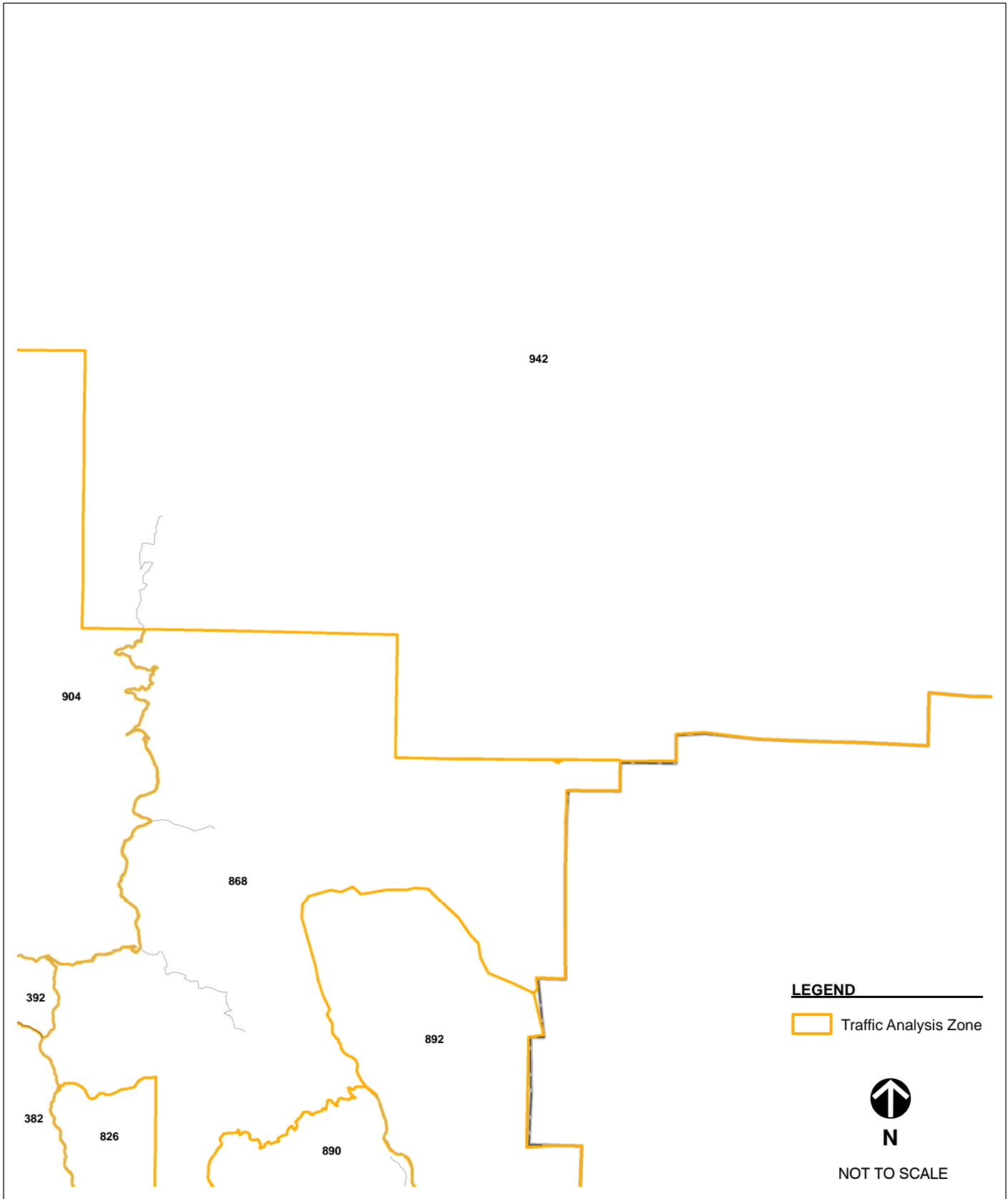













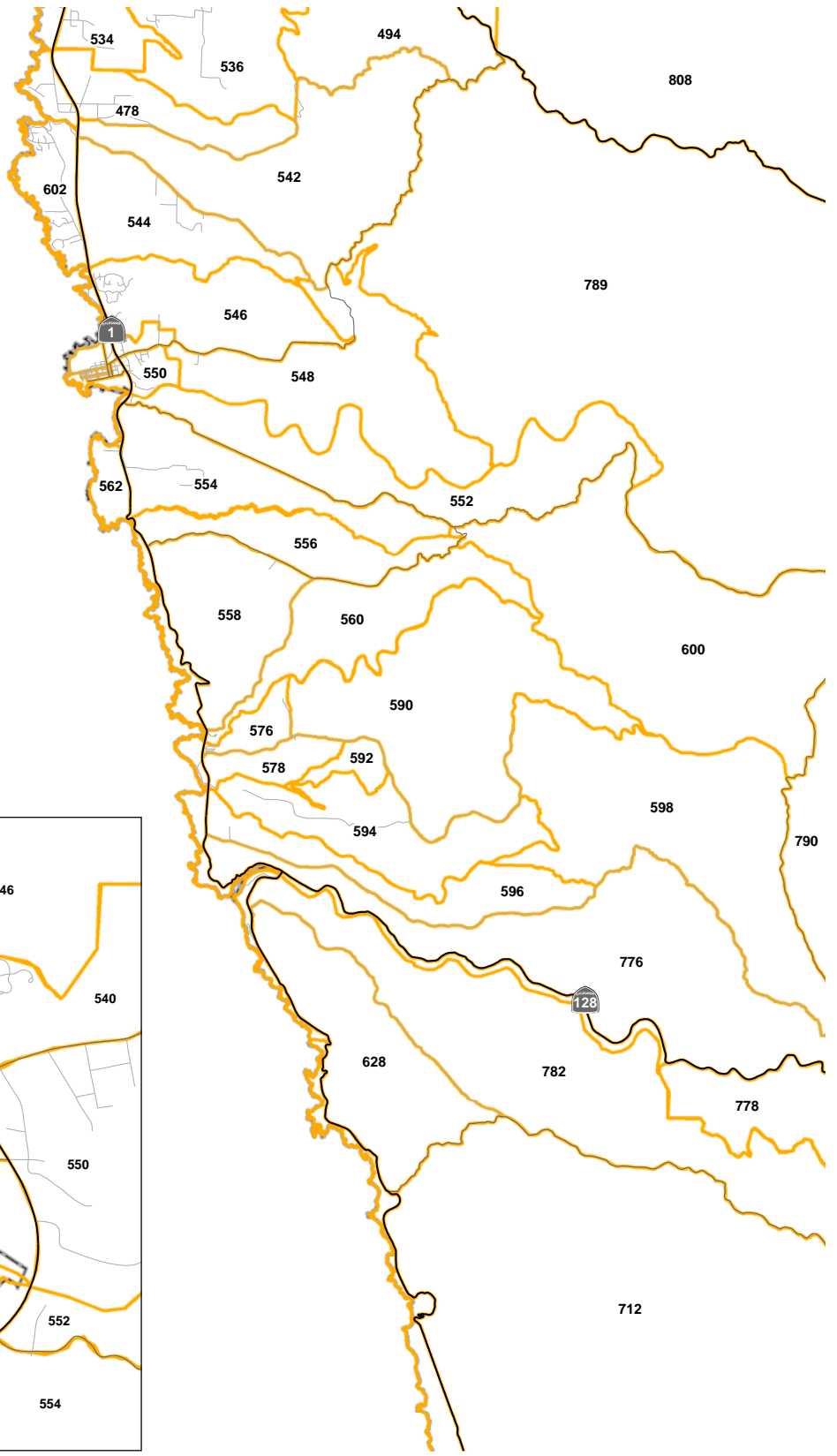
**LEGEND**

 Traffic Analysis Zone

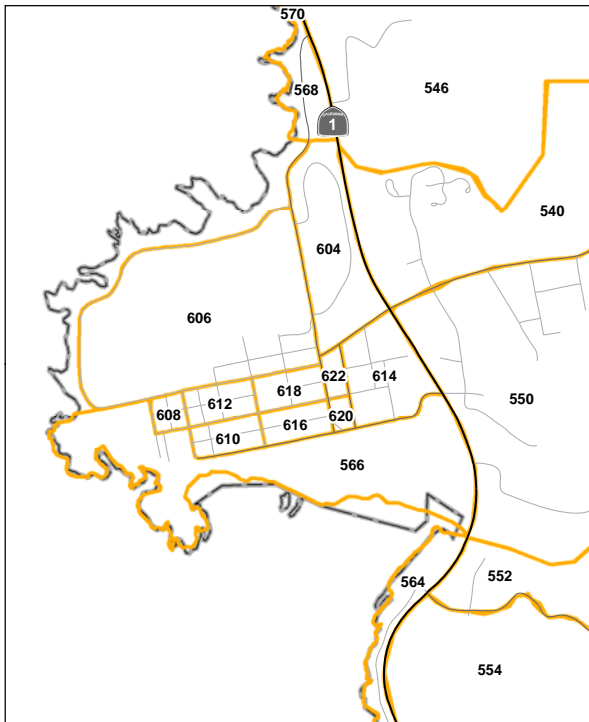


N

NOT TO SCALE



**Downtown Mendocino**



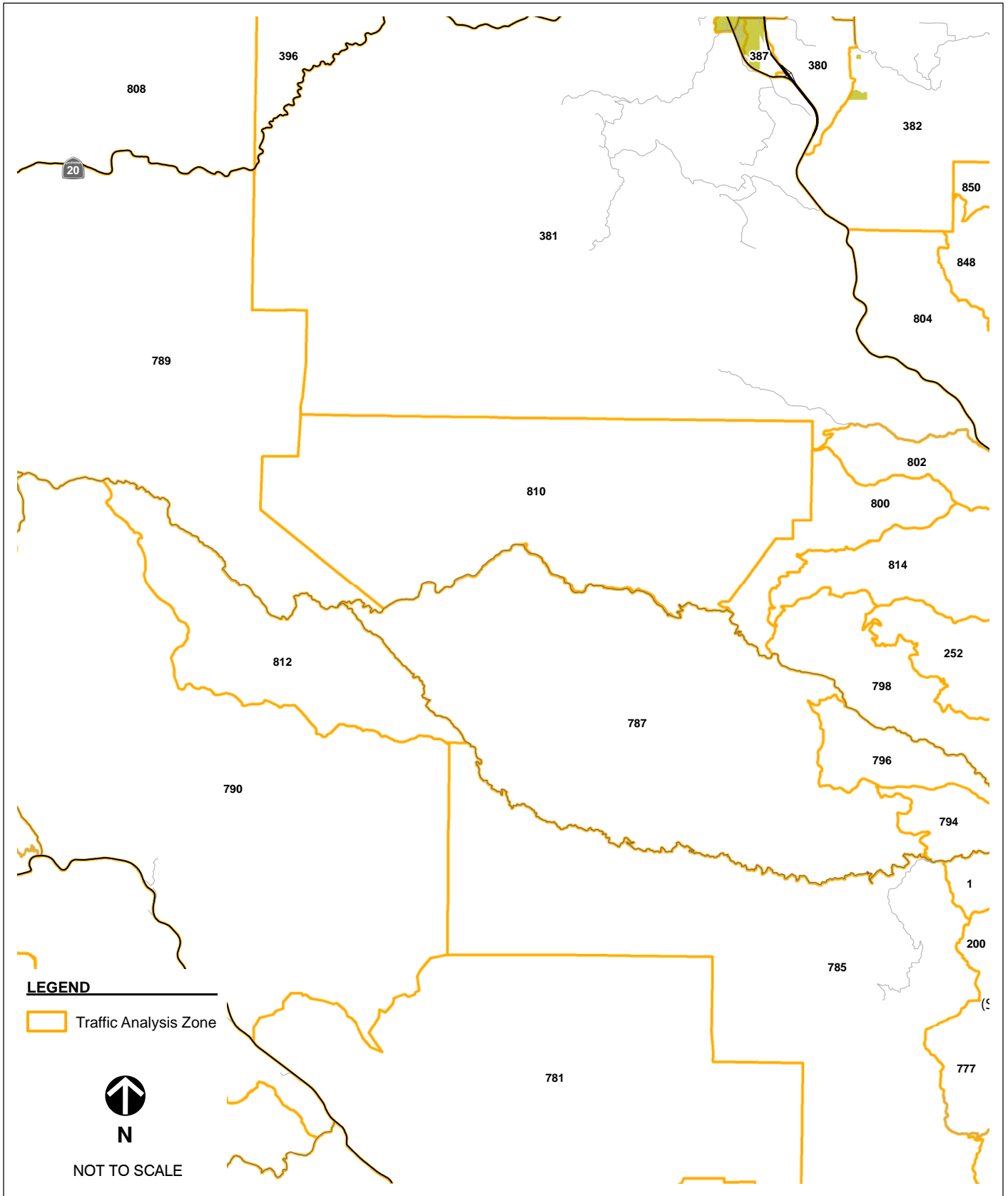
**FEHR & PEERS**  
TRANSPORTATION CONSULTANTS

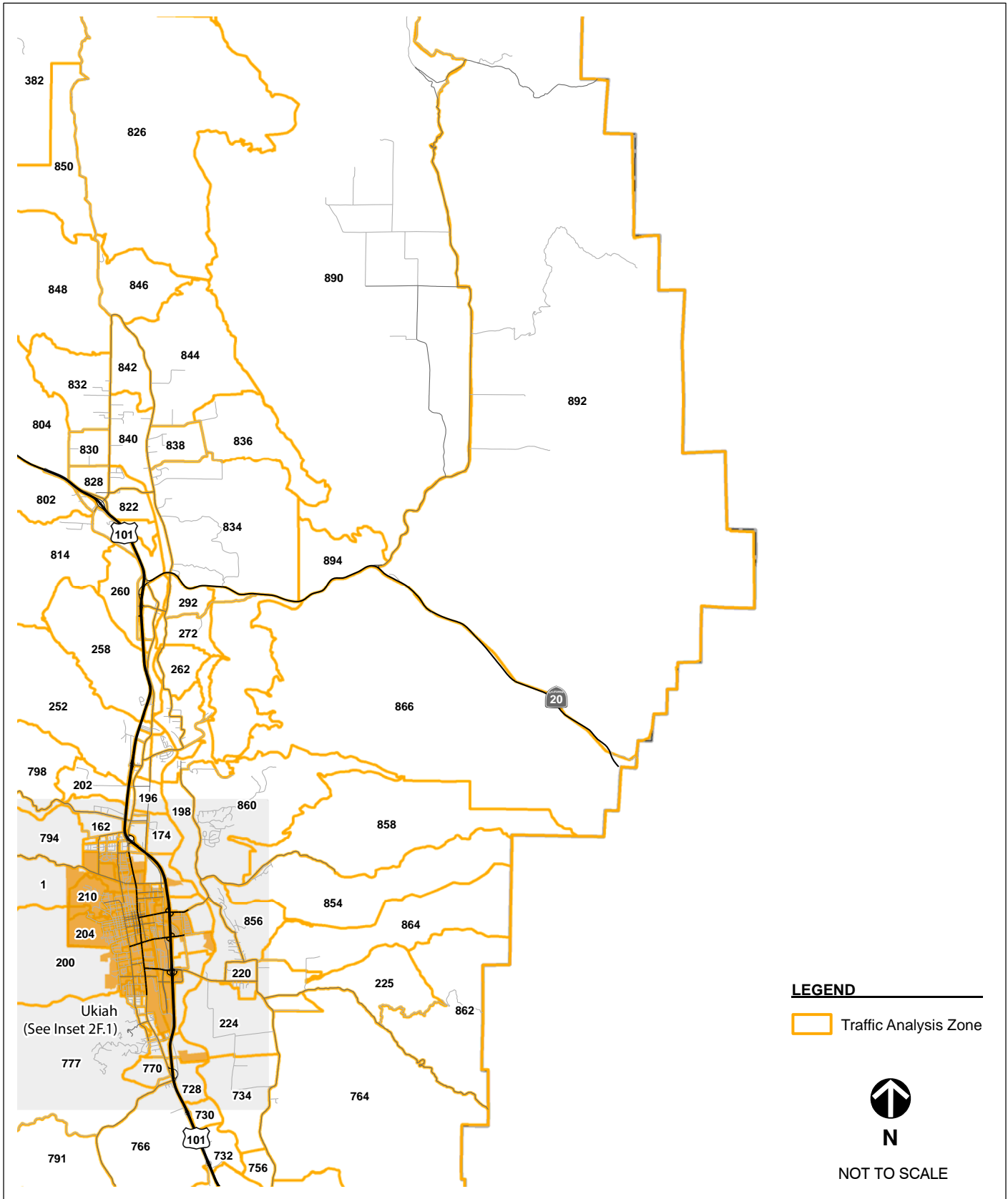
N:\2009Projects\WC\_Projects\WC09-2631\_Mendocino\Draft\Graphics\GIS\MXD\F2D\_TAZ.mxd

**TRAFFIC ANALYSIS ZONES**

**INSET - D**


**FIGURE 2d**







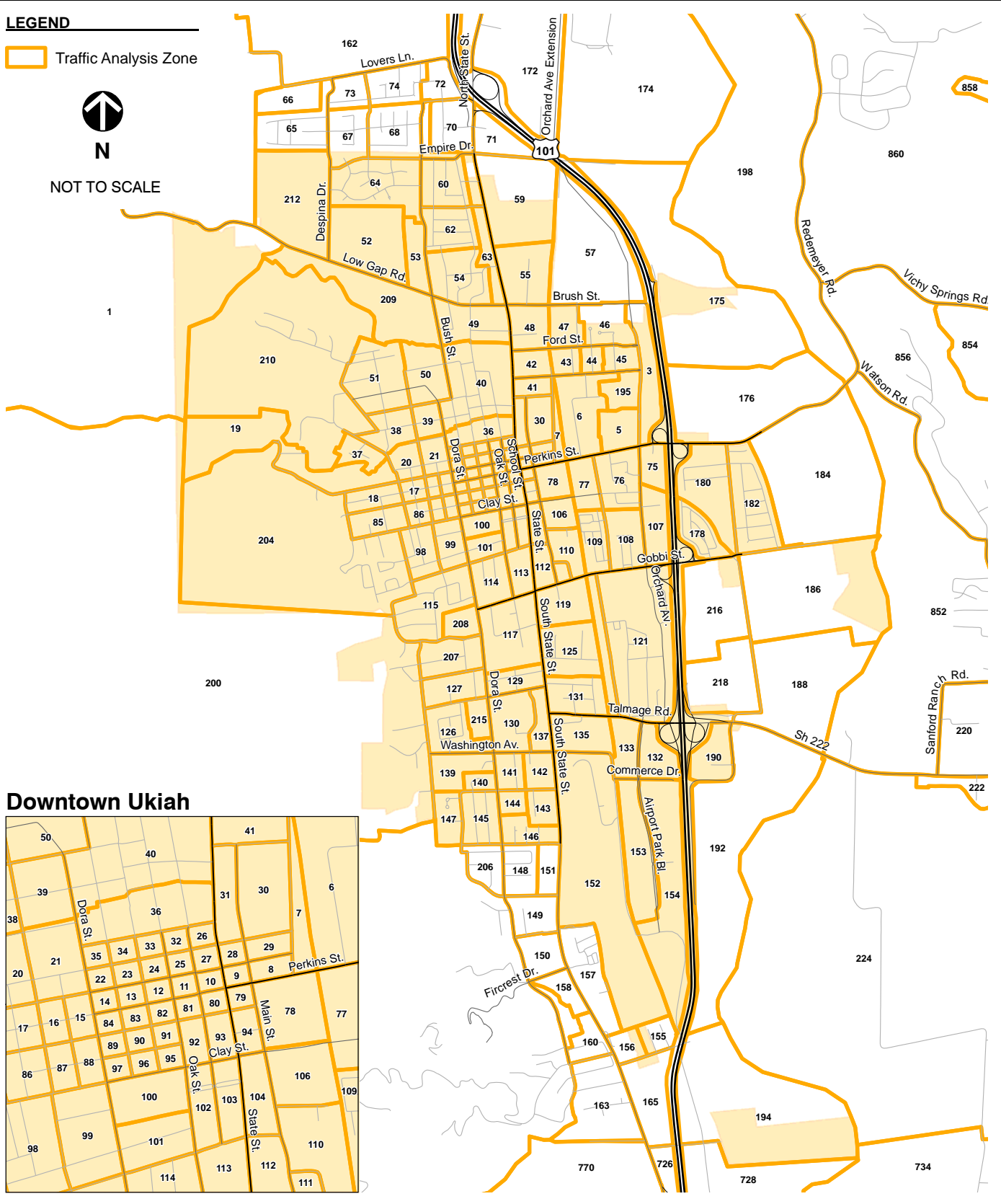
**LEGEND**

 Traffic Analysis Zone

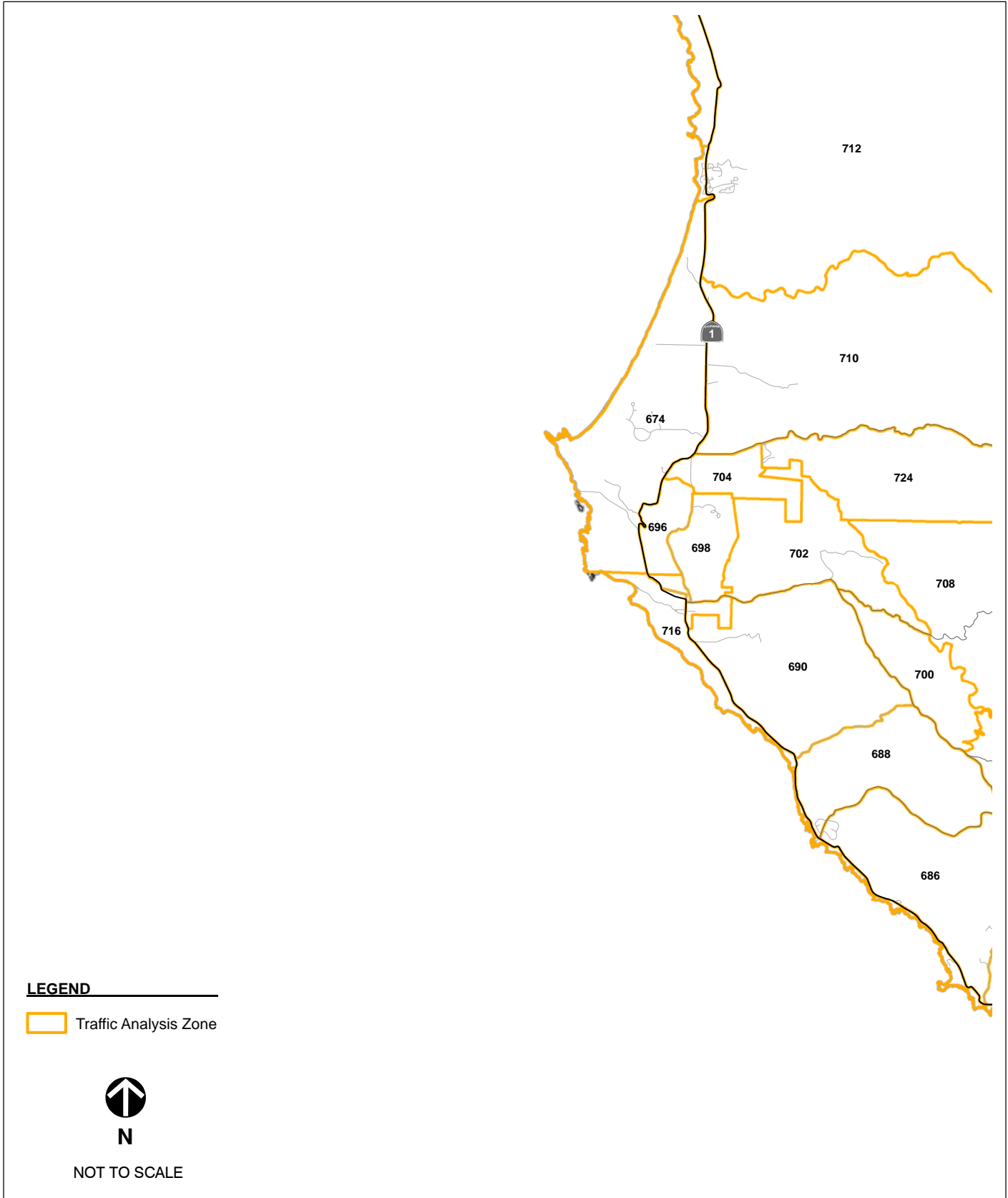


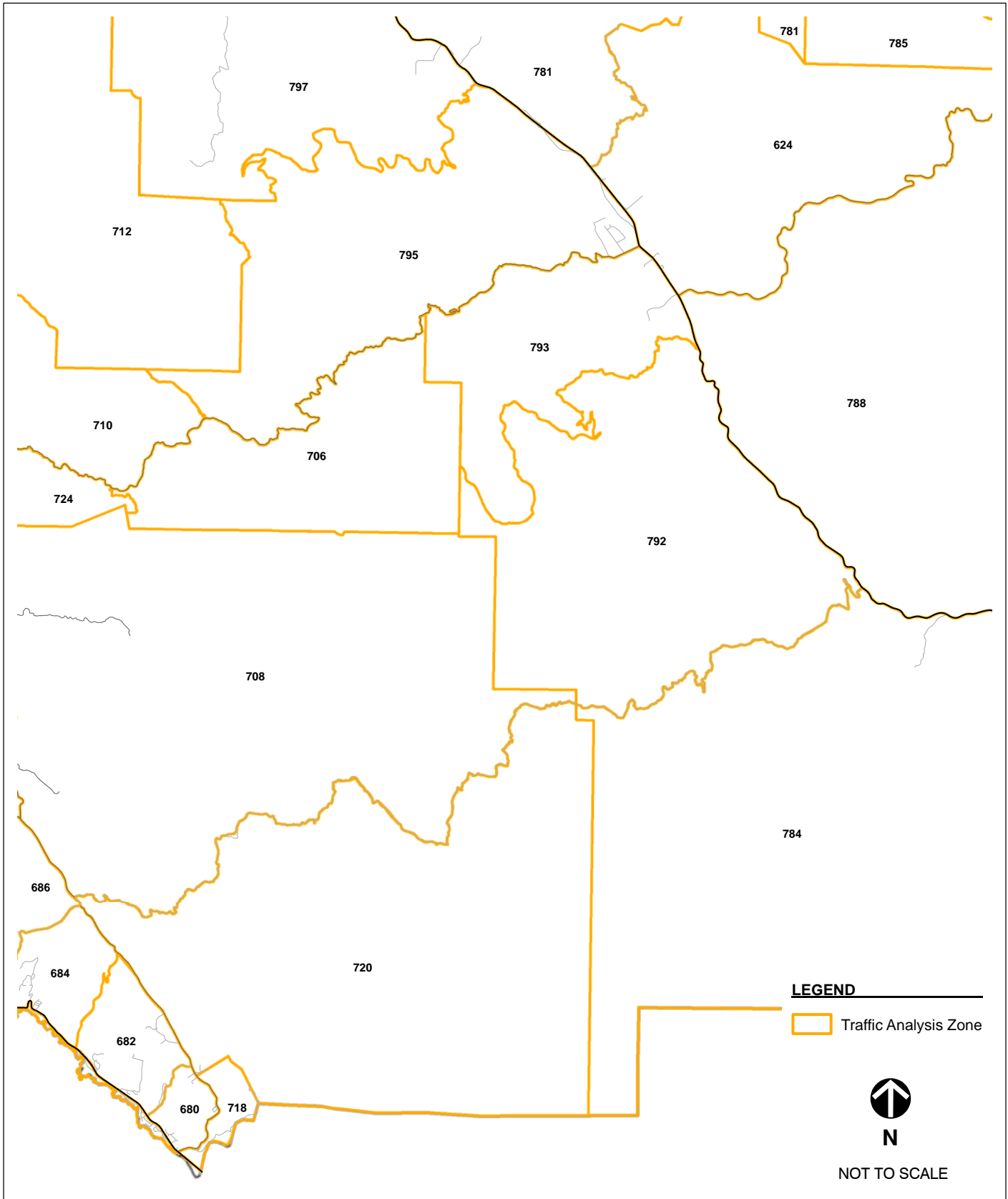
N

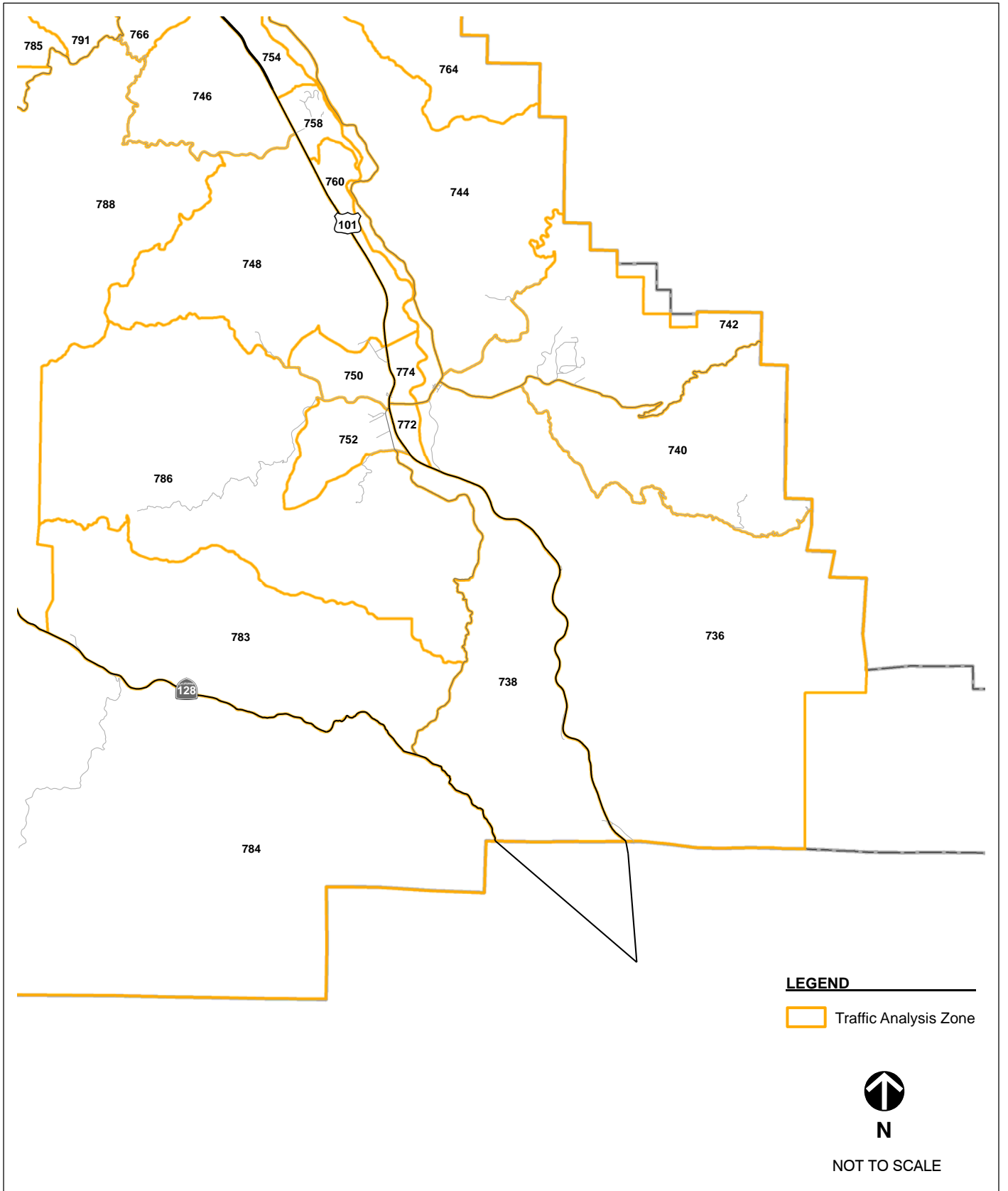
NOT TO SCALE



**Downtown Ukiah**







**TABLE 1 –  
LAND USE DEFINITIONS**

Model Land Use	Land Use Category	Notes or Examples
SEAS_ONLY	Seasonal Dwelling Units	Given zero trip generation, due to uncertain frequency of use and accuracy of data
SF_DU	Single-Family Residential Dwelling Units	
MF_DU	Multi-Family Residential Dwelling Units	
K8_STUD	Students (Kindergarten – 8 <sup>th</sup> grade)	
HS_STUD	High School Students	
AD_STUD	College / University Students	
HOTEL_RMS	Hotel Rooms	
AG_GENERAL	Agricultural Jobs	
AG_WINERY	Winery Jobs	
COM_HIGH	High-Generating Retail Jobs	Grocery Store, Major Retailer
COM_MEDIUM	Medium-Generating Retail Jobs	Small Clothing Stores, Post Offices
COM_LOW	Low-Generating Retail Jobs	Art Galleries, Automobile Repair
OFFICE	Office Jobs (non-medical)	
MEDICAL	Medical Jobs	
ENT_HIGH	High-Generating Entertainment Jobs	Casinos, Resorts, Health Clubs
ENT_LOW	Low-Generating Entertainment Jobs	Live Music and Entertainment Clubs
RESTAURANT	Restaurant Jobs	
IND_HEAVY	Heavy Industrial Jobs	Manufacturers, Trucking
IND_LIGHT	Light Industrial Jobs	General Contractors
GOV_PUBLIC	Public / Government Jobs	

Source: Fehr & Peers, 2010.

### TRIP GENERATION RATES

Tables 2a and 2b summarize the trip generation rates for the MCOG TDF model. The principal sources for data on trip generation rates were *ITE's Trip Generation 8<sup>th</sup> Edition*. However, ITE trip generation rates were superseded in some cases with the rates that were used in the 2008 version of the Ukiah Valley Model. In the case of the retail land use categories, ITE trip generation rates differ widely for the various subcategories of these developments. Therefore, intermediate rates were used that approximate a weighted average of the range of retail found in Mendocino County.

As the base year validation proceeded, it became evident that different subregions within the county generate different numbers of trips from residential uses. This makes logical sense, because of the variety of trip-making characteristics within the county: the coastal regions contain a larger percentage of vacation homes and sublets that are not occupied full-time; the more remote regions which are at least 30 minutes away from most commercial or employment destinations are likely to generate fewer, longer trips; and the larger cities (such as Ukiah and Fort Bragg) are more self-sufficient and thus may generate trips more like the typical cities summarized

**TABLE 2A –  
TRIP GENERATION RATES FOR RESIDENTIAL USES**

Area #	Description	Daily Vehicle-Trip Generation Rates	
		Single-Family Dwelling Units	Multi-Family Dwelling Units
1	North County (Laytonville, Covelo)	6.91	4.25
2	Fort Bragg	9.79	6.02
3	Willits and Potter Valley	8.64	5.31
4	Central Coast (Mendocino, Caspar, Albion)	9.79	6.02
5	Ukiah Valley	11.52	7.08
6	South Coast (Gualala, Point Arena)	9.22	5.66
7	Anderson Valley and Hopland	6.91	4.25

Source: Fehr & Peers, 2010

**TABLE 2B –  
TRIP GENERATION RATES FOR NON-RESIDENTIAL USES**

Land Use Type	Units	Daily Vehicle-Trip Rates	Source for Rate
Elementary / Middle School	Students	1.34	Ukiah Valley Model 2008
High School	Students	1.34	Ukiah Valley Model 2008
College / University	Students	1.34	Ukiah Valley Model 2008
Hotel / Motel / Resort	Rooms	8.17	ITE Trip Generation Manual
Agricultural	Jobs	2.00	Best Estimate
Winery	Jobs	3.00	Best Estimate
Commercial (High-Generating)	Jobs	40.00	Approximate average of ITE Trip Generation Rates for the uses included in this category
Commercial (Medium-Generating)	Jobs	17.20	
Commercial (Low-Generating)	Jobs	9.00	
Office (Non-Medical)	Jobs	4.00	Ukiah Valley Area Model 2008 (converted from rate for ksf assuming 3 jobs / ksf)
Medical	Jobs	5.00	Estimated to be slightly higher than non-medical office
Entertainment (High-Generating)	Jobs	15.00	Approximate average of ITE Trip Generation Rates for the uses included in this category
Entertainment (Low-Generating)	Jobs	5.00	
Restaurant	Jobs	50.00	ITE Trip Generation
Heavy Industrial	Jobs	5.25	Ukiah Valley Area Model 2008 (converted from rate for ksf assuming 1 job / ksf)
Light Industrial	Jobs	1.28	
Government / Public Office	Jobs	5.00	Estimated to be slightly higher than non-medical office

Source: Fehr & Peers, 2010

in the ITE publication. Therefore, the county was separated into seven geographic areas which were assigned different residential trip generation rates, as shown in Table 2a. The boundaries of these areas are shown in Figure 1. The Ukiah Valley area was assigned the same vehicle trip generation rates that were used in the Ukiah Valley model in 2008. Other parts of the county were given lower rates, due to their more rural characteristics.

Table 2b summarizes the trip rates for non-residential land uses, which do not vary by area. Table 2b also indicates the source from which the rate was obtained or estimated. The “notes or examples” column in Table 1 above contains further detail on categories that don’t describe their actual uses directly, such as “medium-generating commercial.”

A complete set of detailed trip generation rates is provided in Appendix C.

## TRIP PURPOSES

The MCOG travel demand model uses four trip purposes. Trip purposes are used to distinguish trips based on their spatial and temporal distribution patterns<sup>1</sup>. The trip purposes used in the MCOG model are:

- Home-Based Work (HBW) Trips: These are trips between the traveler’s residence and his/her workplace.
- Home-Based School (HBSK) Trips: These are trips between the traveler’s residence and an elementary school, junior high school, high school, or university.
- Home-Based Other (HBO) Trips: These are all other trips with one end at the traveler’s home that do not fall into any of the other categories. Shopping trips from a home to a local retail establishment, for example, are HBO trips.
- Non-Home-Based (NHB) Trips: All trips where neither end is the traveler’s home are non-home-based trips. Examples include trip chaining between stores, or from an office to a restaurant.

## ROADWAY NETWORK

The road network was based on the street centerline file from Mendocino County. Figure 3 displays the road functional classifications for the Base Year, and Table 3 summarizes the general capacities and free-flow speeds used for each roadway functional classification in the model. The majority of free-flow speeds were provided by Mendocino County staff and were not changed. However, certain roadways were modified on a case by case basis to aid with the validation process. For example, speeds on the stretches of SR 1 that are very curvy were reduced from 50 to 40 MPH.

Both existing roadways and future roadway improvements are coded into one master network. The master network concept will help manage the model network files, because users will not need to perform the same edit in multiple network scenarios. The future road improvements can be easily turned on and off by changing the construction year field (YR\_BUILT) in the master network, or by changing the numbers of lanes (AB\_LANE\_xx and BA\_LANE\_xx, where xx is the two-digit year). The existing roadways that will be closed in the future can also be coded in the master network by zeroing out the future number of lane fields (AB\_Lane\_xx and BA\_LANE\_xx).

Appendix H contains a detailed description the model network attributes.

---

<sup>1</sup> As an example, shopping trips tend to be taken more in the afternoon and are shorter in length than work trips, which tend to have distinct AM and PM peaks and are longer in length.

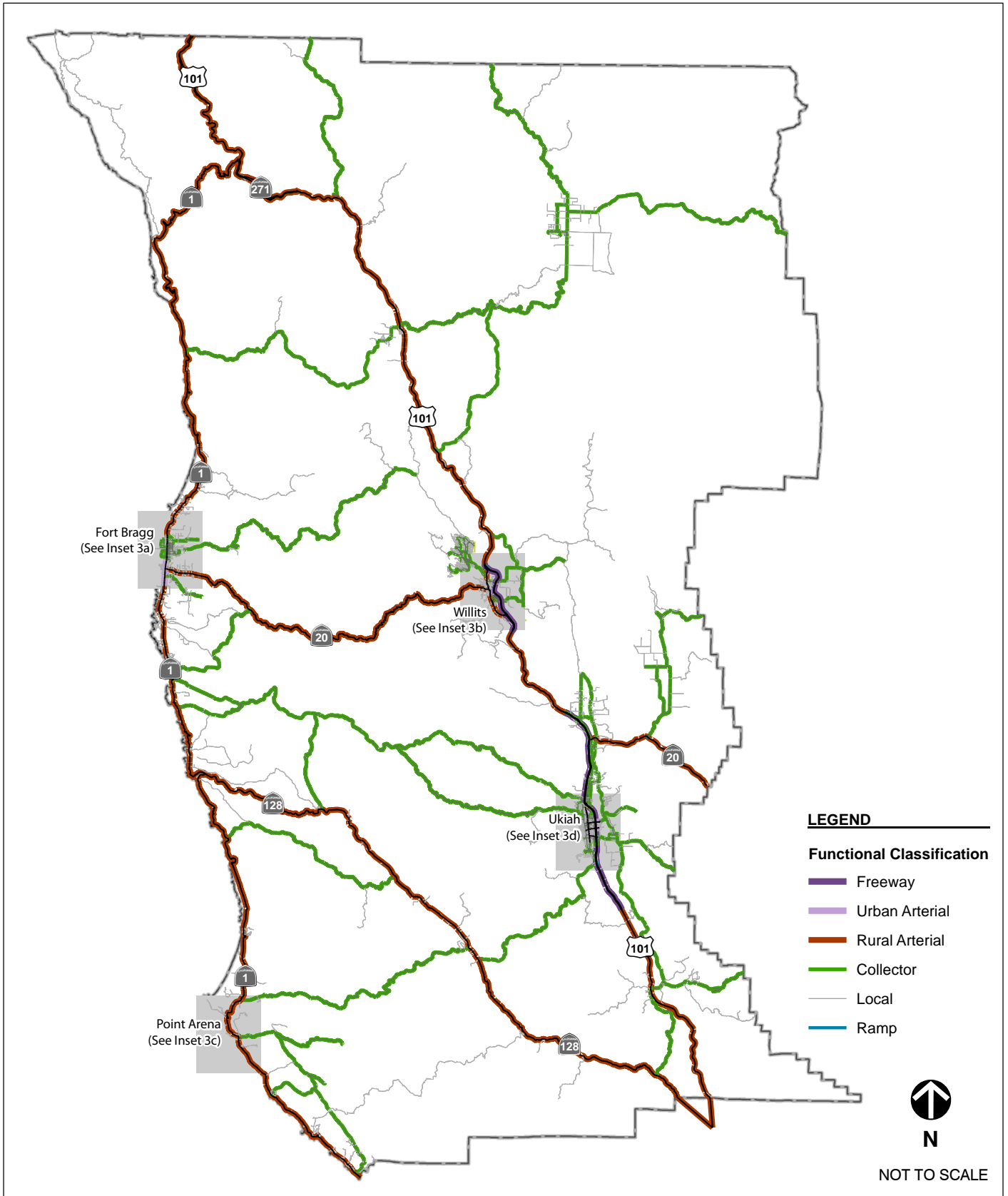
**TABLE 3 –  
 ROAD CAPACITY BY FUNCTIONAL CLASSIFICATION**

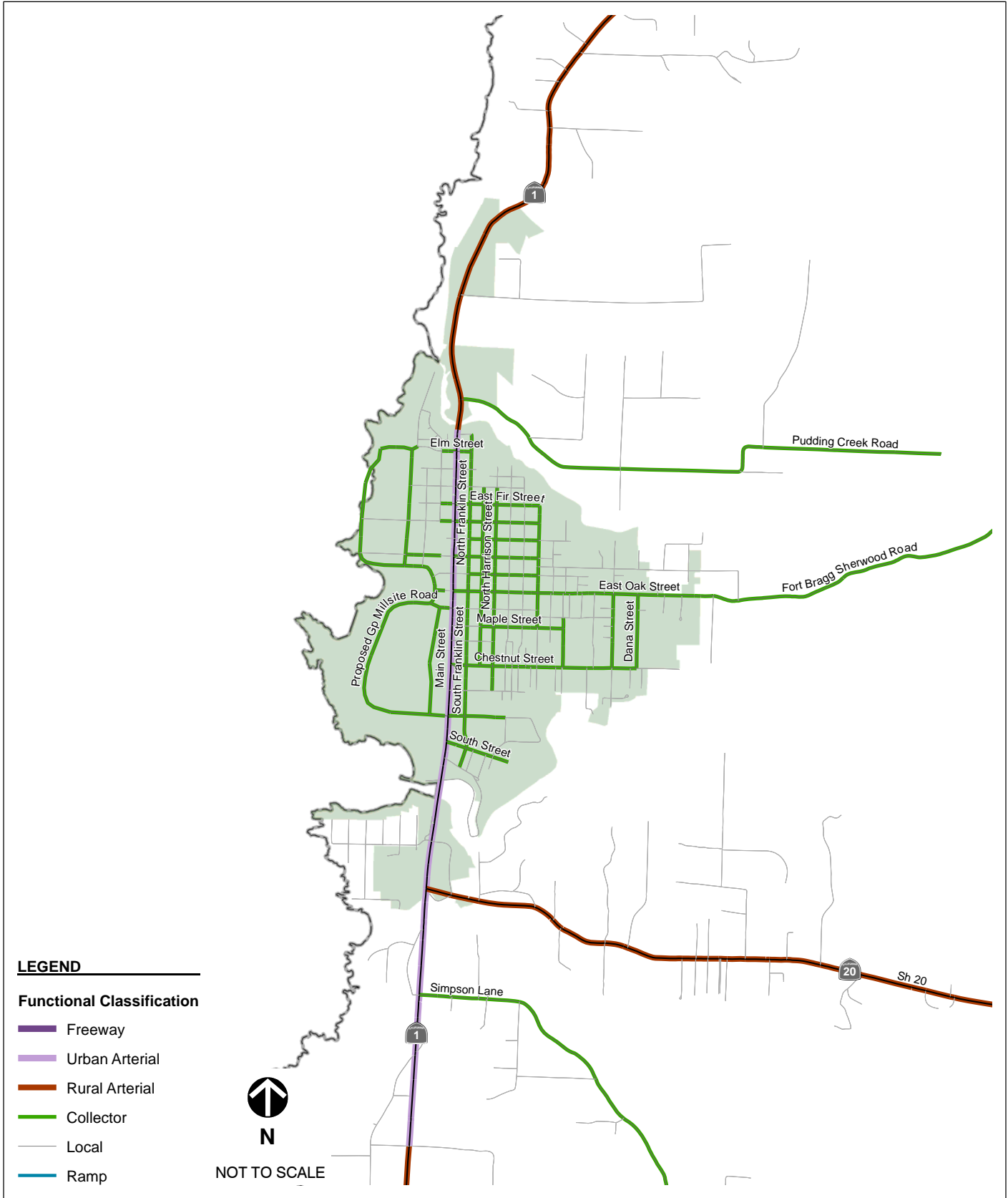
<b>Roadway Classification</b>	<b>Capacity (vehicles per hour per lane)</b>	<b>Typical Free-Flow Speed (MPH)</b>
Freeway Mainline	2,000	55-65
Freeway Ramp	1,500	40
Urban Arterial	900-1,000	35-40
Rural Arterial	700-1,000	40-50
Collector	500-700	25-55
Local	400	25
Centroid Connector <sup>1</sup>	10,000	25

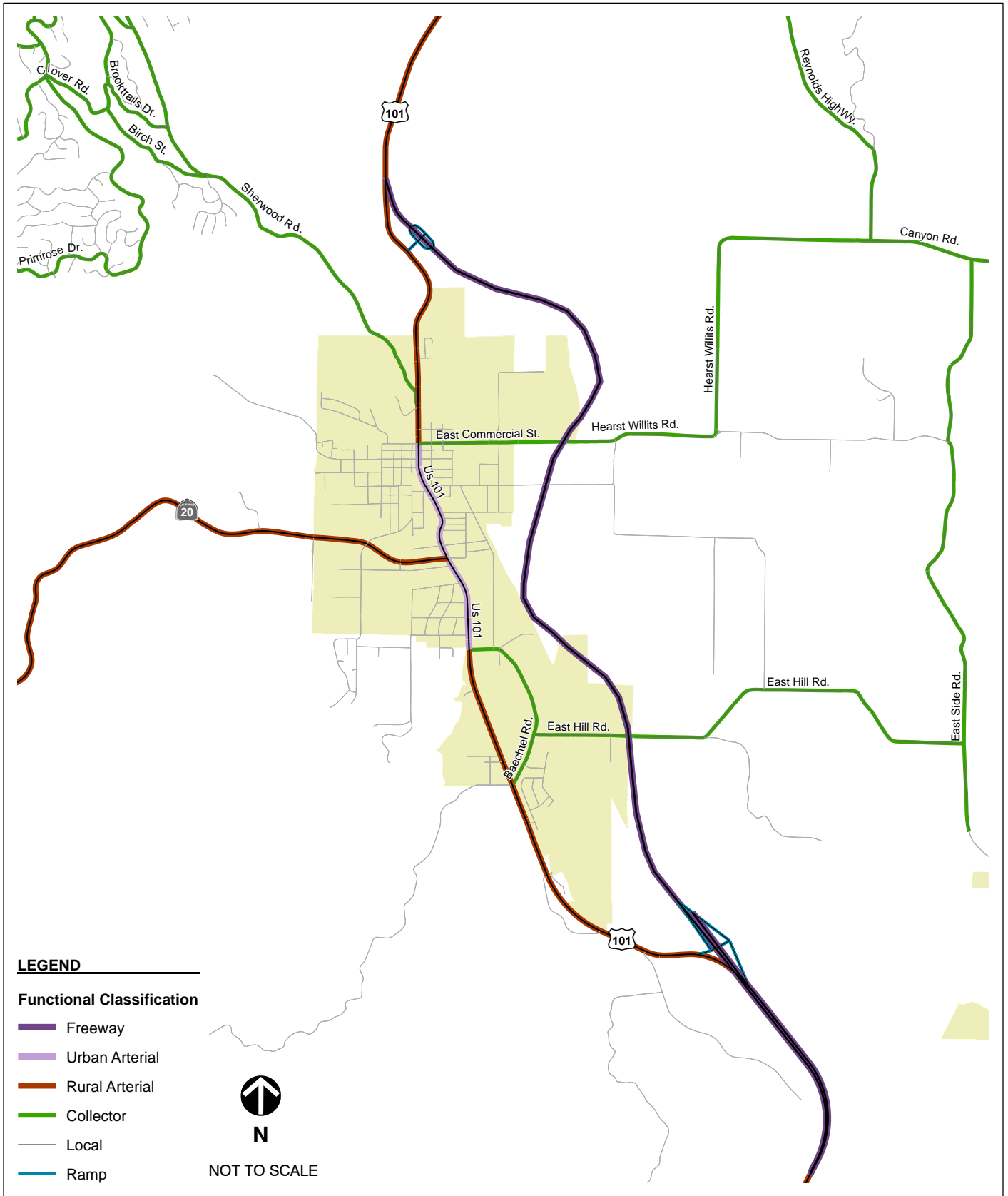
<sup>1</sup> Centroid connectors are abstract representations of the starting and ending point of each trip. Capacity is set significantly higher than other model links to prevent travel times from being affected by capacity on these abstract links.

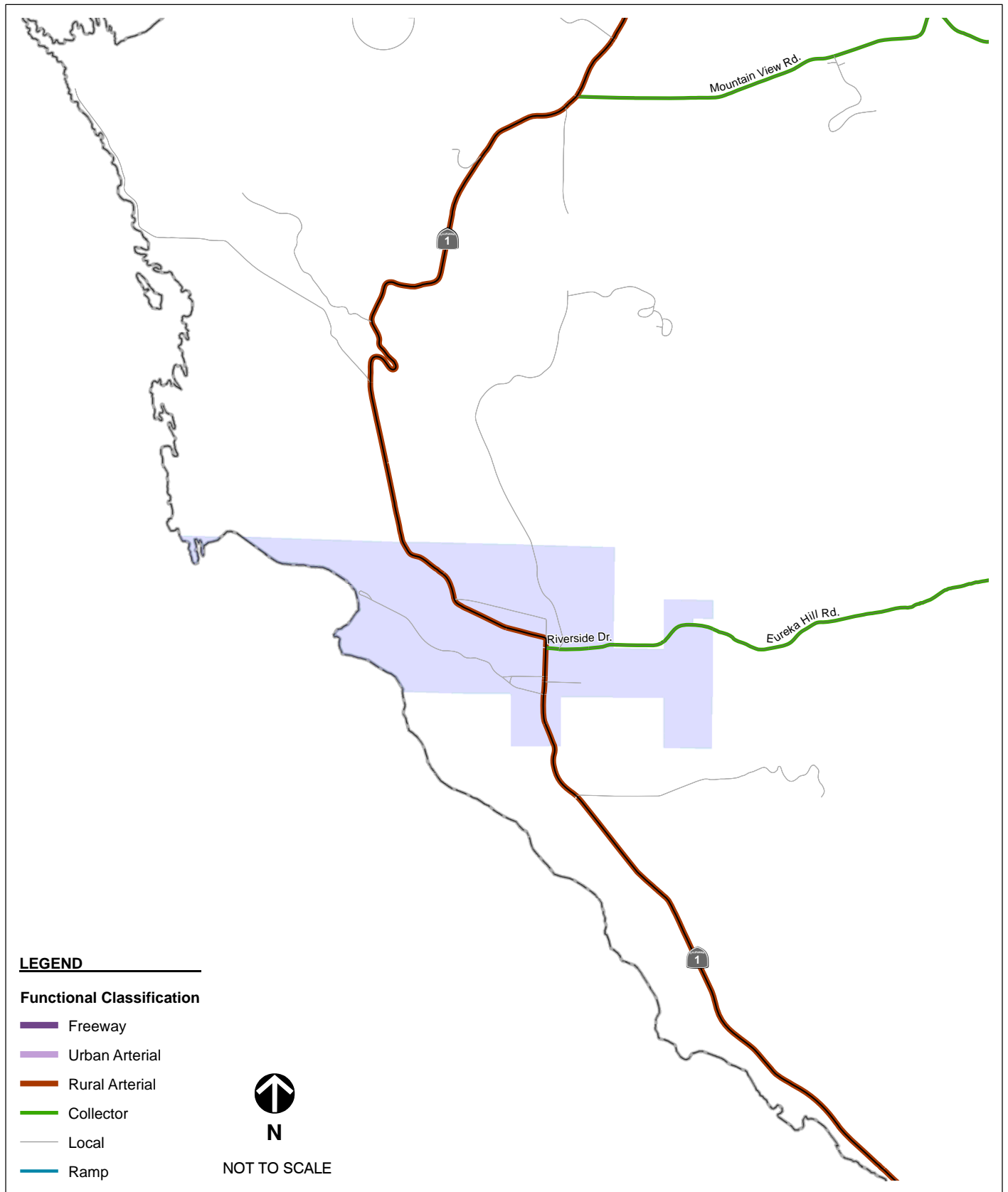
The traffic counts for daily, AM peak hour, and PM peak hour conditions were coded for later use in comparing the model-generated traffic volumes to the observed counts and for use in adjusting future forecast volumes. The traffic count data were collected from several sources, including Caltrans, Mendocino County, the Ukiah Valley Model Development project, and some new counts taken in the spring of 2009 in Fort Bragg and Willits for this project.

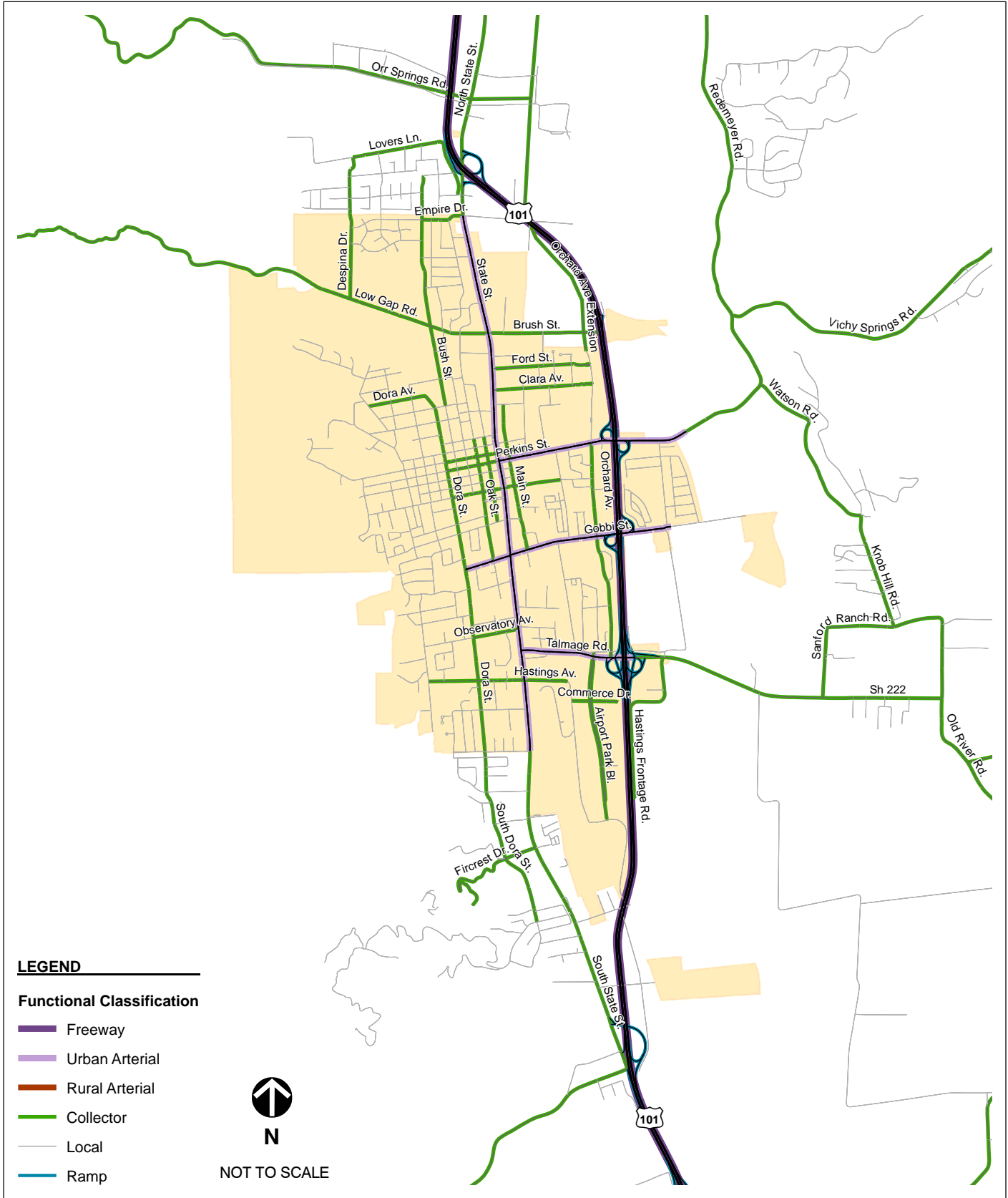












## FRICION FACTORS

Friction factors, also known as travel time factors, determine the relative attractiveness of each destination zone based on the travel time between TAZs and the number of potential origins and destinations in each TAZ. These factors are used in the trip distribution stage of the model. Friction factors reported in national modeling reference documents such as National Cooperative Highway Research Program (NCHRP) 365, and modified based on local conditions, were used in the MCOG TDF model.

To validate the friction factors, the MCOG TDF model's average trip length was compared to the average trip length published in the 2000 California Statewide Travel survey, which contains data specifically for Mendocino County. Since the MCOG TDF model does not explicitly model internal to external (IX) or external to internal (XI) trips, only the intra-county trips from the survey data were used for comparison. The average MCOG TDF model intra-county trip length was 4.4 miles, which compares to 5.4 miles from the statewide household travel survey. This difference is reasonable given the fact that the survey data are rounded to the nearest mile, and that the model trip lengths for short trips are highly dependent on the location of the TAZ's centroid, which is always an approximation.

## EXTERNAL TRAVEL CHARACTERISTICS

External to external (XX) trips, or through trips, represent trips that pass through the County without stopping. As discussed above, IX and XI trips begin or end outside the County but have one trip end within the County.

Since it is cost-prohibitive to obtain license plate data to measure XX trips directly, the best estimate of XX trips is based on taking traffic counts at each of the major gateways to the county, and then subtracting the best estimate of IX and XI trips.

IX and XI trips can be estimated by assuming certain percentages of total trips, with that percentage varying by trip purpose. The 2006 American Community Survey, an ongoing survey conducted by the US Census bureau that collects demographic and socioeconomic information, includes county-to-county journey to work data. The survey indicates that 95 percent of all Mendocino County *work* trips remain within the county, both for residents of and employees within Mendocino County. Since work trips tend to be longer than other trips, it is logical to assume that shopping and non-work trips will be even more likely to remain within the county.

IX and XI trip percentages were therefore set to make the overall percentage of work trips leaving the county to be roughly 5 percent, and non-work IX and XI trip percentages were set lower. The percentages varied geographically, to be higher for the regions more accessible to Santa Rosa (Ukiah and the South Coast), and lower for the other parts of the county that are further away from any large external cities. Overall, the MCOG TDF model has 97 percent of all trips internal to the county. In the validation process, the model volumes at the links leaving the county were checked against traffic counts to confirm the XX, IX, and XI travel characteristics. The relative numbers of IX and XI trips at each gateway are called "station weights," and represent the percentages of IX and XI trips attracted to each gateway to the county.

## PEAK HOUR MODEL

In addition to estimating daily traffic volumes, the model provides estimates of traffic in the morning and afternoon "peak hours", when traffic volumes are at their highest point. The development of peak hour volumes is useful to assist with roadway facility planning, particularly for determining appropriate intersection sizing and traffic control.

The MCOG model uses a series of factors to convert daily model volumes into AM and PM peak hour volumes; the factors are different for each trip purpose, reflecting the fact that different trip purposes tend to be clustered during different periods of the day. These factors were calibrated to provide the most accurate possible peak hour validation results, while staying within the realm of reasonability based both on published national factors and factors found in traffic models from comparable areas to Mendocino County. Appendix E contains the peak hour factors.

### 3. SUMMARY OF MODEL VALIDATION

In addition to the validation of the friction factors and external travel characteristics described above, the MCOG TDF model was also validated to determine how well the base year model was able to match existing traffic counts (i.e., static validation) and how well the model responded to changes in land use and roadway network changes (i.e., dynamic validation). This section of the report describes the static and dynamic validation procedures and presents the results.

#### STATIC VALIDATION

Static validation is the term used to describe the model's performance as it relates to how well the model's estimate of roadway segment traffic volumes for the base year matches existing traffic counts. Caltrans and the Federal Highway Administration have identified certain guidelines regarding acceptability of model performance. The following describes the model performance in comparison to the Caltrans *Travel Forecasting Guidelines*, November 1992, *Travel Model Improvement Program (TMIP) Model Validation and Reasonableness Checking Manual*, February 1997, and Fehr & Peers' internal standards.

#### VALIDATION COMPARISON TECHNIQUES

Travel model accuracy is tested using the following comparison techniques.

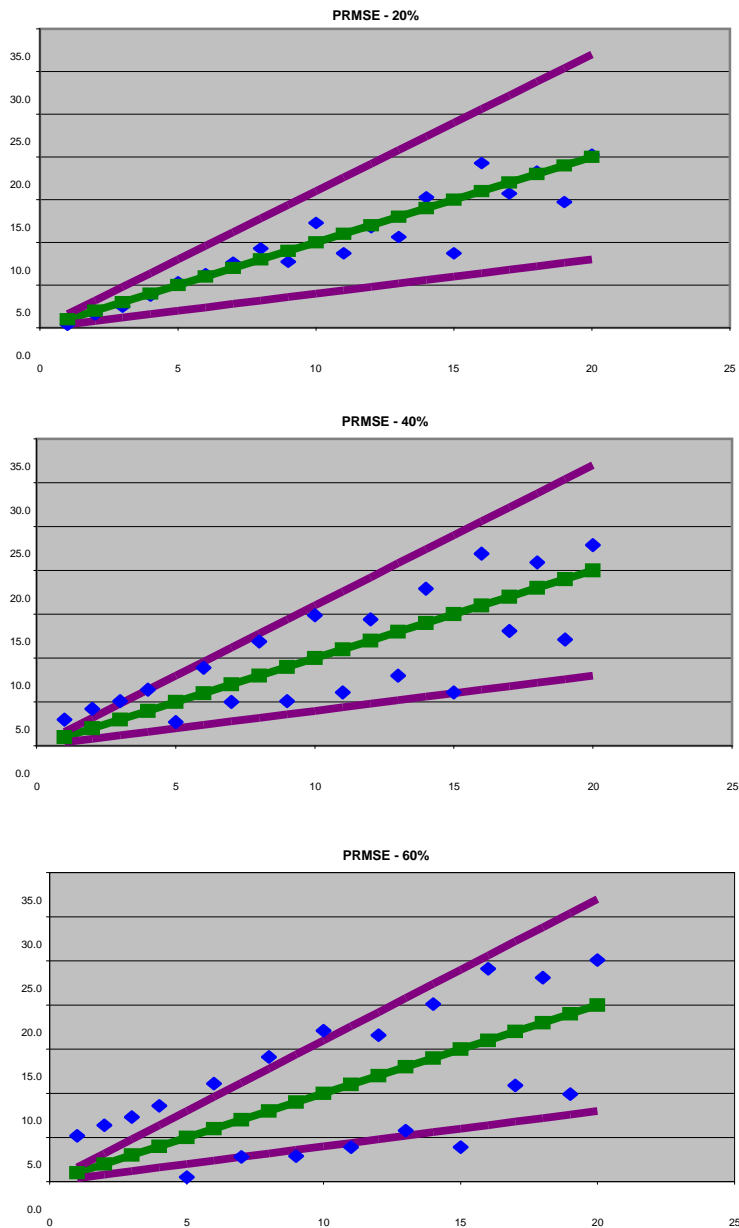
1. The volume-to-count ratio is computed by dividing the volume assigned by the model and the actual traffic count for individual roadways model-wide.
2. The deviation is calculated as the difference between the model volume and the actual count divided by the actual count.
3. The correlation coefficient estimates the correlation between the actual traffic counts and the estimated traffic volumes from the model.
4. The Percent Root Mean Square Error (PRMSE) is the square root of the model volume minus the actual count squared divided by the number of counts. It is a measure similar to standard deviation in that it assesses the accuracy of the entire model.

In addition to these static validation tests, dynamic validation was performed to test the model's stability to verify that reasonable output responses occurred based on varying input variables.

#### STATIC VALIDATION STANDARDS

For a model to be considered accurate and appropriate for use in traffic forecasting, it must replicate actual conditions within a certain level of accuracy and demonstrate sufficient sensitivity to changes in the model's input variables. Since it is difficult for any model to replicate all counts precisely, validation guidelines have been established. The following summarizes key validation targets based on the Caltrans guidelines, TMIP guidelines, and Fehr & Peers' internal standards for the MCOG TDF model.

- Screenlines are groupings of roadway links that capture traffic flows in a particular direction. All screenlines should be within their maximum desirable deviation, which ranges from approximately 5 to 60 percent, depending on total volume.
- A minimum of 75 percent of the roadway links should be within their maximum desirable deviation, which ranges from approximately 5 to 60 percent, depending on total volume.
- The model-wide correlation coefficient is suggested to be greater than 0.88.
- The aggregate Percent Root Mean Square Error (PRMSE) should be less than 40 percent for all links with counts or by facility type and area type.



**Figure 4 – PRMSE Examples**

Figure 4 presents PRMSE values of 20 percent, 40 percent, and 60 percent. Each graph presents the following information: traffic counts (green lines), maximum and minimum allowable deviation (purple lines), and traffic model forecasts (blue data points). With a PRMSE of 40 percent, most of the traffic volume forecasts are within the allowable deviation established by Caltrans and are generally clustered around the existing traffic count curve. At 20 percent, all of the traffic volume forecasts are within deviation and are more closely clustered around the traffic count curve. At 60 percent, most of the traffic volume forecasts exceed allowable deviation and are not well clustered around the traffic count curve. To provide perspective, if the traffic model perfectly replicated all traffic counts, the PRMSE would be zero (0) percent and the traffic volume forecasts (blue data points) would fall exactly along the existing traffic count curve (green line).



## STATIC VALIDATION RESULTS

Once all the input data described in Chapter 3 were collected, the 2009 MCOG Travel Demand Model was run and the model results were examined and checked for reasonableness. Link volumes that did not conform with traffic counts were investigated further, which led to the correction of land use and roadway network errors, and modifications of the model parameters.

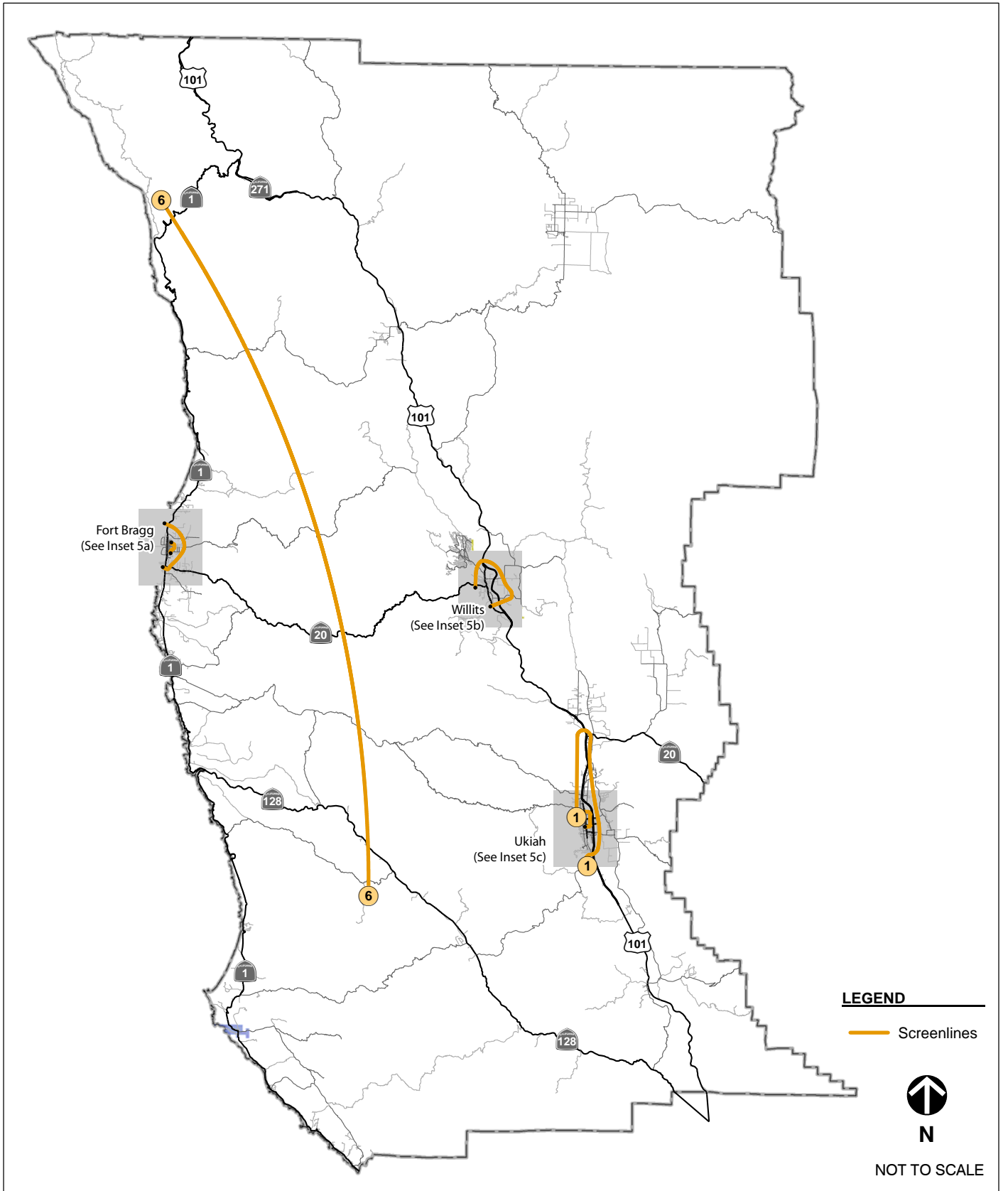
Figure 5 displays the screenlines for the model validation. Table 4 summarizes the static validation results on the seven screenlines defined throughout the County.

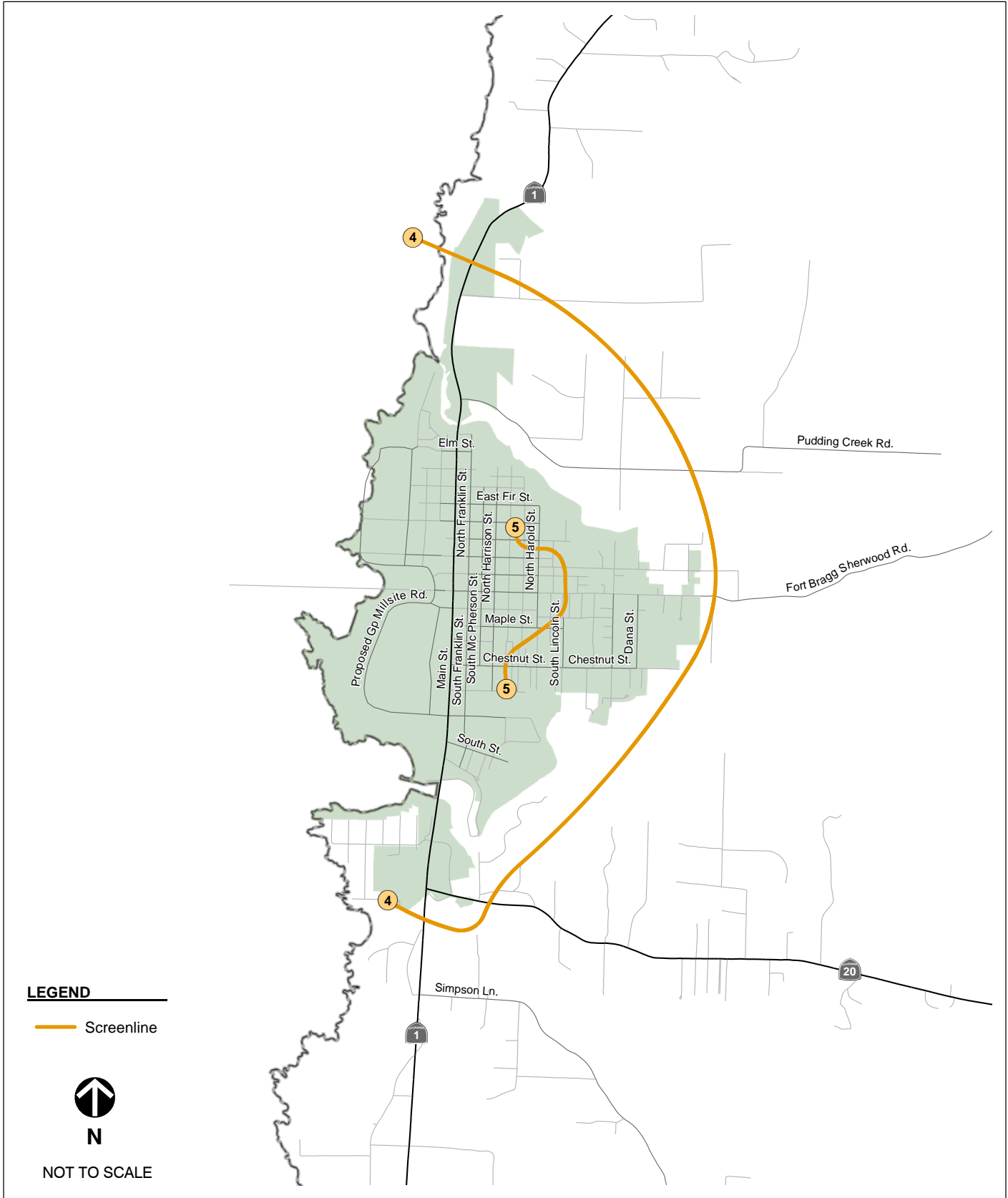
Validation Statistic	Caltrans Guidelines	Daily
Volume-to-Count Ratio for Worst Performing Screenline	-	0.78
Volume-to-Count Ratio for Best Performing Screenline	-	1.01
Percent RMSE for Worst Performing Screenline	-	35%
Percent RMSE for Best Performing Screenline	-	10%
Percent of screenlines within allowed maximum deviation	100%	100%

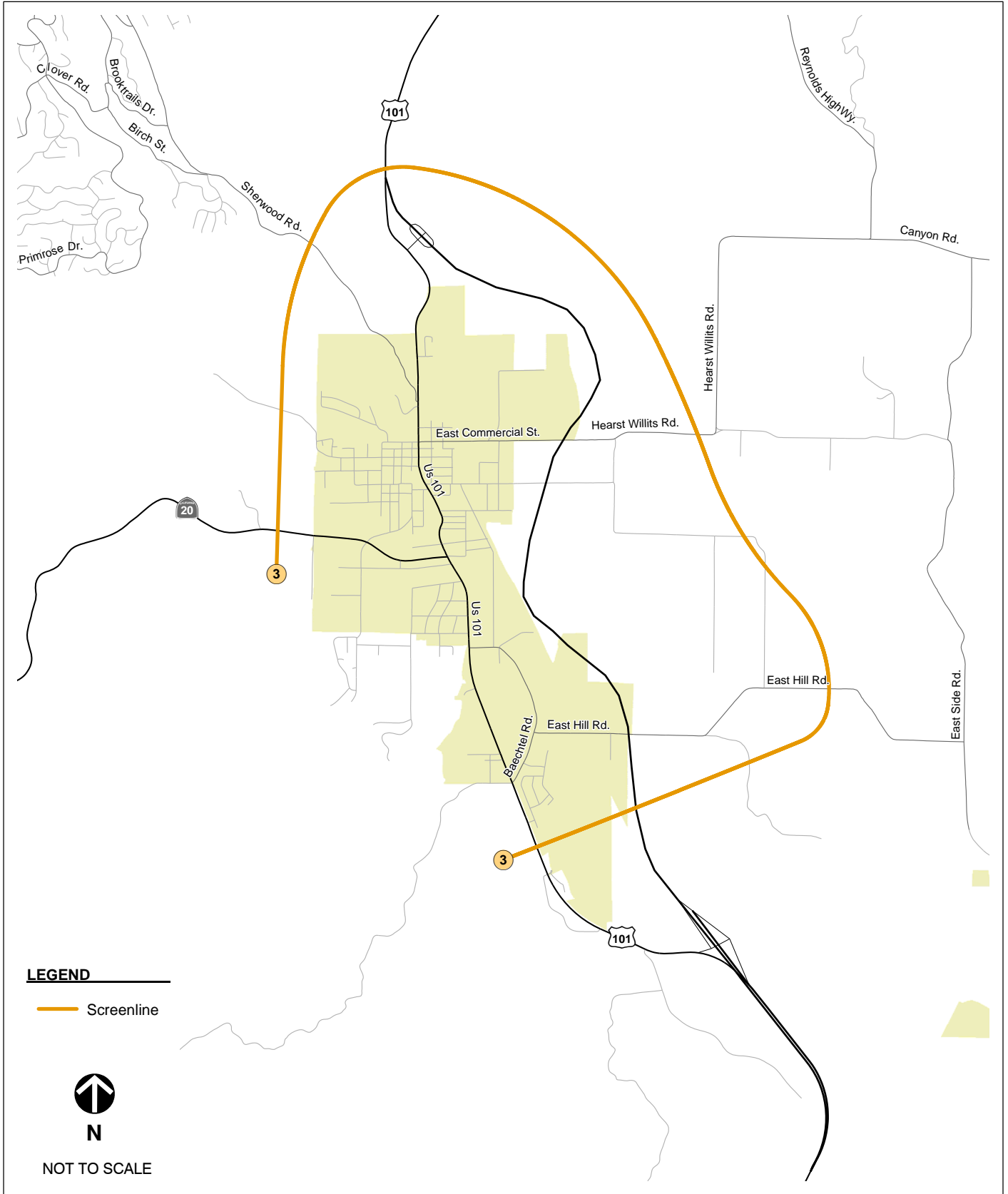
The TDF model generates results that meet the screenline volume validation guidelines established in Caltrans' guidelines and Fehr & Peers' internal standards.

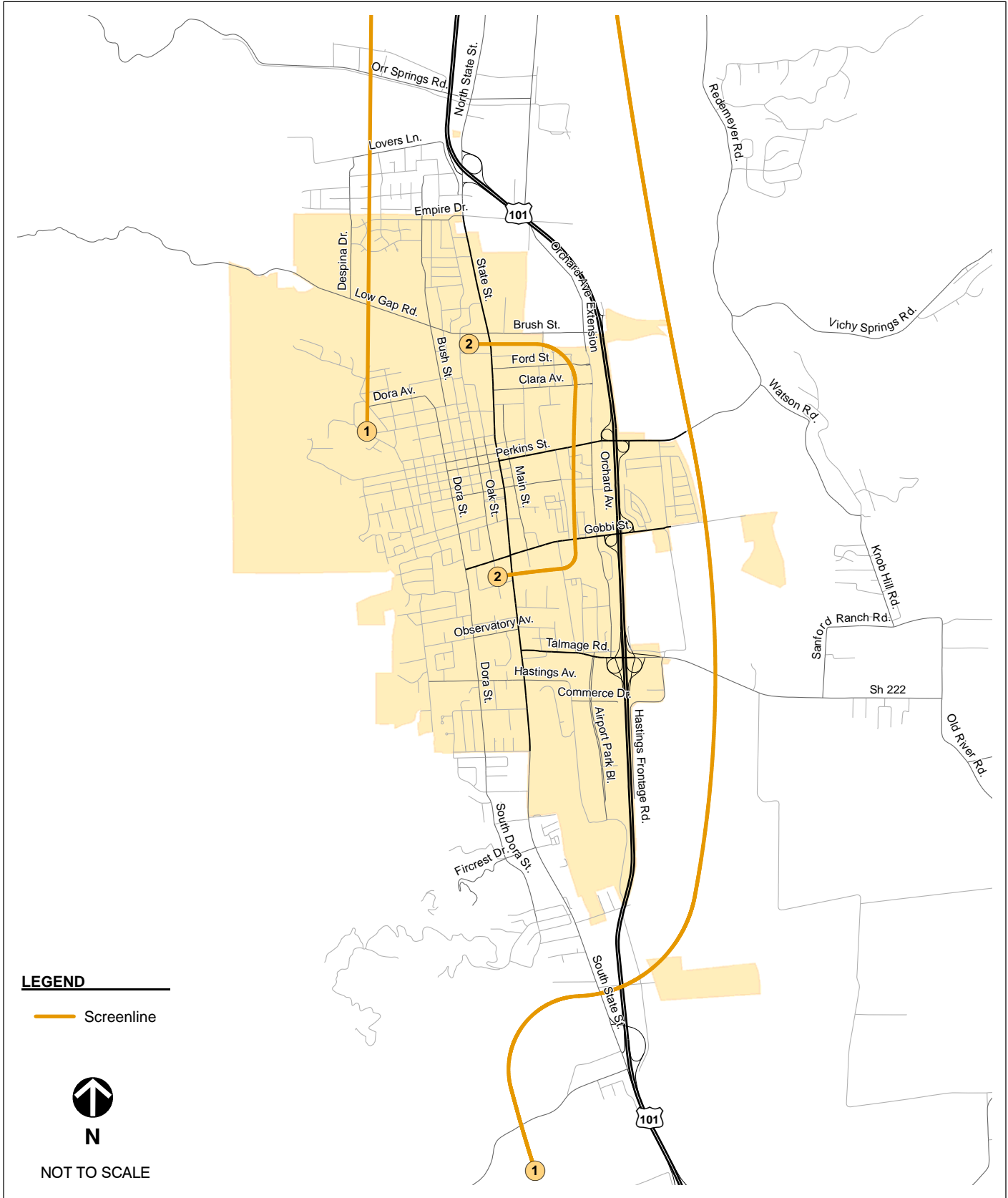
Table 5 summarizes the aggregate static validation results for all validation links.

Validation Statistic	Caltrans and TMIP Guidelines	Daily	AM Peak Hour	PM Peak Hour
Total number of links for validation	-	146	127	176
Minimum one-way volume for inclusion in validation	-	1,000	100	100
Volume-to-Count Percent Error for all directional links	-	-10% ✓	-4% ✓	-5% ✓
Percent of directional links within allowed maximum deviation	> 75%	90% ✓	80% ✓	77% ✓
Correlation Coefficient	> 0.88	0.92 ✓	0.79 ✗	0.77 ✗
Overall PRMSE at link level	< 40%	30% ✓	48% ✗	50% ✗









All aggregate static validation results exceed the validation guidelines established in the Caltrans and TMIP guidelines for the daily conditions. For the AM and PM peak hour conditions, all results exceed the guidelines except for the correlation coefficient and the PRMSE, both of which come close to the guidelines. Because of the rural nature of the County, many roads carry relatively low volumes of traffic, particularly in a single hour. It can be very difficult for a large-scale model to accurately replicate traffic conditions on low-volume roads, and relatively small differences in results can translate into large percentage differences when the baseline is very low. Based on our experience in calibrating the Mendocino County model and other models for rural areas, we feel that the peak hour models are performing at an acceptable level, and additional refinements would likely provide minimal benefit to the validation statistics compared to the effort required. Appendix D contains detailed static validation summary reports.

## DYNAMIC VALIDATION

The previous section described a validation process that consisted of comparing the model's traffic volume estimates for the base year to traffic counts taken for the same year. This is "static" validation in that it judges the model's ability to replicate a static set of conditions (the traffic counts). While this provides some useful information, models are seldom used for static applications. By far the most common use of models is to forecast how a change in inputs would result in a change in traffic conditions. A useful test of a model's accuracy is to measure the model's ability to predict differences in outputs as inputs are changed; in other words, "dynamic" validation rather than static validation. This section describes the results of the dynamic validation tests that were performed on the MCOG TDF model.

The first set of tests was to add or subtract single-family dwelling units in varying quantities to see how the model responds to this type of change in input. Single-family dwelling units were added to TAZ 932 in Willits and subtracted from TAZ 382 in Willits. Figure 6 presents the results of adding 10 single family homes to a zone. Figure 7 presents a summary of the overall results, which are analyzed below.

- The number of vehicle trips (VT) generated was generally stable at about 7.5 trips/dwelling unit. The model trip generation rate for a single-family dwelling unit in Willits is 8.6 trips per dwelling unit.
- Adding and subtracting the same number of dwelling units produced changes in assigned trips that were generally equal in magnitude and opposite in direction, as expected.
- The trend of both the vehicle miles traveled (VMT) and the vehicle hours traveled (VHT) for an added or subtracted dwelling unit was generally in the right direction and of the right magnitude.

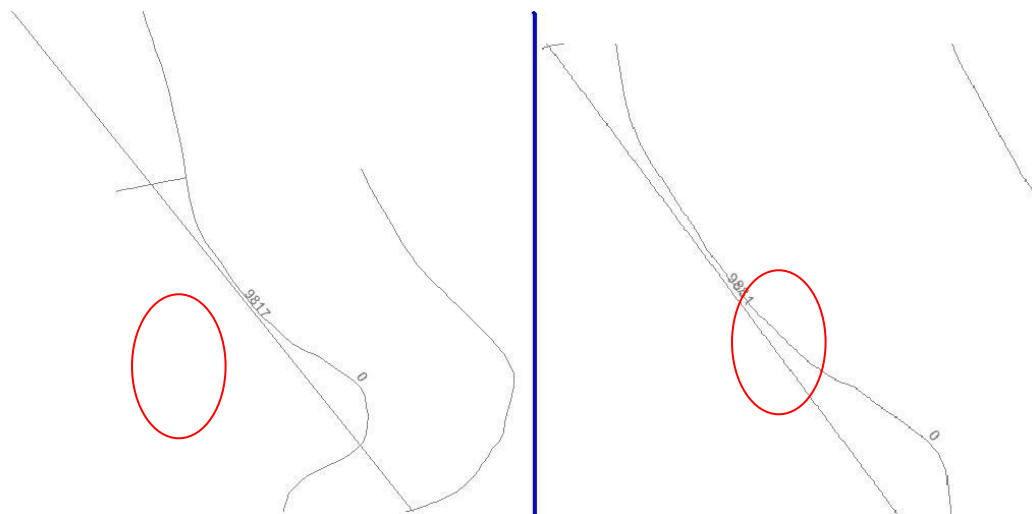


Figure 6 – Change in Vehicle Trips with 10 Additional Single Family Homes

1. Generally stable over entire range

Case	Change in DUs	Vehicle Trips (VT)	Change in VT	(Change in VT)/ (Change in DUs)	Vehicle Miles Traveled (VMT)	Change in VMT	(Change in VMT)/ (Change in DUs)	Vehicle Hours Traveled (VHT)	Change In VHT	(Change in VHT)/ (Change in DUs)
Base Case	0	418,201	-		2,720,922	-	-	67,458	-	-
Add 1 DU	1	418,209	8	8.0	2,721,022	100	100.0	67,461	3	3.0
Add 10 DUs	10	418,277	76	7.6	2,722,183	1,261	126.1	67,495	37	3.7
Add 100 DUs	100	418,947	746	7.5	2,732,470	11,548	115.5	67,805	347	3.5
Add 1,000 DUs	1,000	425,661	7,460	7.5	2,843,031	122,109	122.1	71,583	4,125	4.1
Subtract 10 DUs	-10	418,126	-75	7.5	2,719,839	-1,083	108.3	67,432	-26	2.6
Subtract 100 DUs	-100	417,454	-747	7.5	2,710,219	-10,703	107.0	67,206	-252	2.5

2. Similar magnitude and opposite in direction

3. Trend in right direction and magnitude

FIGURE 7 – DYNAMIC VALIDATION OF CHANGES IN DWELLING UNITS

The second set of tests was to add or subtract retail space in varying quantities to see how the model responds to this type of change in input. Retail was added to TAZ 112 in Ukiah and subtracted from TAZ 3 in Ukiah in increments of employees. Figure 8 shows the volumes at the centroid connector before and after adding 10 retail employees. The overall results are shown on Figure 9 and summarized below.

- The number of vehicle trips (VT) generated was generally stable at about 40 trips per employee. Figure 10 shows that adding 10 retail employees to a TAZ resulted in 399 new daily trips at the centroid, or about 40 new trips per employee. The model trip generation rate for retail employees in Ukiah is 40 trips per employee.
- Adding and subtracting the same number of retail employees produced changes in assigned trips that were generally equal in magnitude and opposite in direction, as expected.
- The trend of both the vehicle miles traveled (VMT) and the vehicle hours traveled (VHT) for an added or subtracted retail employees was generally in the right direction and of the right magnitude.

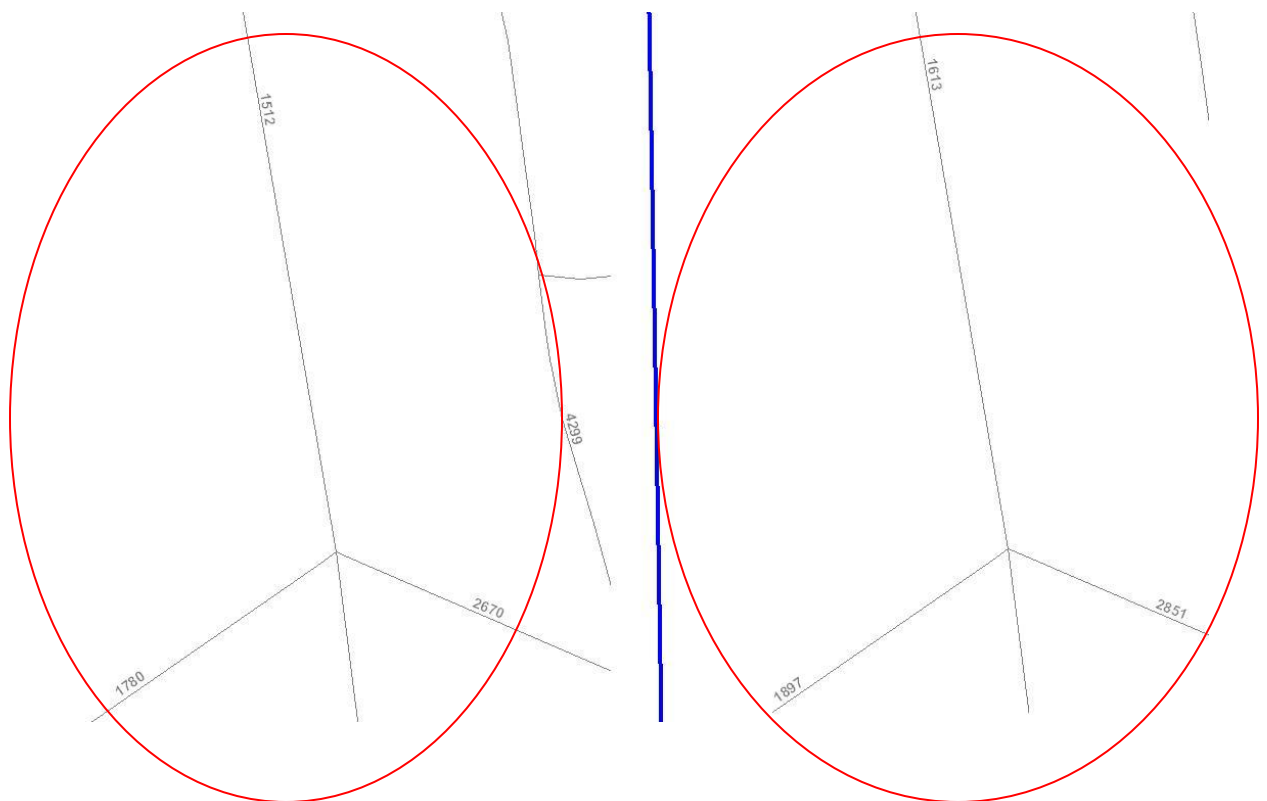


Figure 8 – Change in Vehicle Trips with 10 Additional Retail Employees



1. Generally stable over entire range

Case	Change in Employees	Vehicle Trips (VT)	Change in VT	(Change in VT)/ (Change in Employees)	Vehicle Miles Traveled (VMT)	Change in VMT	(Change in VMT)/ (Change in Employees)	Vehicle Hours Traveled (VHT)	Change In VHT	(Change in VHT)/ (Change in Employees)
Base Case	0	418,201	-	-	2,720,922	-	-	67,458	-	-
Add 1 Employee	1	418,211	10	10.0	2,721,155	233	233.0	67,463	5	5.0
Add 10 Employees	10	418,293	92	9.2	2,723,247	2,325	232.5	67,512	54	5.4
Add 100 Employees	100	419,117	916	9.2	2,743,506	22,584	225.8	67,979	521	5.2
Subtract 1 Employee	-1	418,193	-8	8.0	2,720,775	-147	147.0	67,455	-3	3.0
Subtract 10 Employees	-10	418,109	-92	9.2	2,718,663	-2,259	225.9	67,403	-55	5.5
Subtract 100 Employees	-100	417,285	-916	9.2	2,699,100	-21,822	218.2	66,933	-525	5.3

2. Similar magnitude and opposite in direction

3. Trend in right direction and magnitude

FIGURE 9 – DYNAMIC VALIDATION OF CHANGES IN RETAIL EMPLOYEES

The previous tests evaluated how well the MCOG model responded to changes in land use. The final set of tests evaluates how the model responds to changes in the roadway network. The first roadway modification test involves the removal of Oak Street north of Gobbi Street in downtown Ukiah. Table 6 summarizes the result.

<b>TABLE 6 – DYNAMIC VALIDATION OF REMOVAL OF A LINK IN ROAD NETWORK</b>			
<b>Location</b>	<b>With Oak Street</b>	<b>Without Oak Street</b>	<b>Ratio</b>
Oak Street	2,741		
State Street	11,214	12,676	1.13
Total	13,955	12,676	0.91

With the removal of Oak Street, a portion of the traffic was distributed to State Street, a parallel north-south roadway, as expected. While the volume on State Street increased, the screenline volumes went down. This result is reasonable since the reduction in north-south roadway capacity makes travel more difficult and redistribution of trips will occur during the feedback loop.

Finally, the model was tested to see how it would respond to the addition of a link to the road network. For this test, Redemeyer Road in Ukiah was extended to connect at Orr Springs Road / State Street. Table 7 summarizes the results.

<b>TABLE 7 – DYNAMIC VALIDATION OF ADDITION OF A LINK IN ROAD NETWORK</b>			
<b>Location</b>	<b>Without Redemeyer</b>	<b>With Redemeyer</b>	<b>Ratio</b>
Vichy Springs Road	6,324	4,992	0.79
Redemeyer Road Extension		1,494	
Total	6,324	6,486	1.03

The new connection drew some traffic away from the adjacent streets, as expected. Vichy Springs Road had a decrease in volume, and the screenline volumes went up. Because travel was easier with more capacity to and from northeast Ukiah, redistribution of trips occurred during the feedback loop.

The results of the dynamic validation tests show that the MCOG travel demand model produces reasonable results for the most common types of model applications.

## 4. FUTURE YEAR MODEL

This chapter describes how the future year (2020 and 2030) versions of the MCOG TDF model was developed. In general, the future year model was developed by modifying the base year version of the model to include a new land use file and roadway network file. In addition, the through trip (XX) matrix was modified and adjustments to the station weights were considered to account for growth in surrounding counties.

### FUTURE LAND USE FILES

In many TDF models, the future year land use is developed by a jurisdiction or consultant by determining the amount of development that is allowed under buildout of the various General Plans that cover the area. Occasionally, this buildout forecast is scaled back since it is unlikely that all of the designated land uses would build out by a defined forecast year. This is particularly true in Mendocino County, where full buildout of the lands designated as potentially developable for residential uses would equate to development of more than 20,000 housing units, which would represent a growth rate of more than 50% over existing conditions. County staff indicate that there is similar excess development potential for commercial uses, as well. Clearly, development of this magnitude is not plausible by 2030.

Therefore, the 2030 land use file for the MCOG TDF model was developed by using State Department of Finance (DOF) 2030 population projections and 2025 commercial forecasts developed by Economic and Planning Systems (EPS) for the County as guides. The County sought input from the various cities to identify the areas most likely to develop, and then the remaining growth was allocated equitably over the remaining areas. Figure 10 presents the 2009-2030 growth in dwelling units per TAZ and Figure 11 presents the 2009-2030 growth in jobs per TAZ. The 2030 land use file is presented in Appendix F.

The 2020 land use inputs were derived as the average of the 2009 and 2030 land use for each TAZ in the model.

### FUTURE ROADWAY NETWORKS

To develop the future roadway networks, the base year roadway network from the validated model was used as a starting point and the improvements shown in Table 8 were added to the network. The list of roadway improvements was developed by Mendocino County staff, starting from the list of projects in the Ukiah Valley AB1600 Nexus Study from 2008, and adding some projects outside the Ukiah Valley.

Please note that the land use and network assumptions for 2030 represent a first cut at projected growth and roadway improvements in Mendocino County, and can be revised in future planning efforts. The level of accuracy of the 2030 assumptions does not affect the base year (2009) validation of the model.

### EXTERNAL TRAVEL CHARACTERISTICS

As described in Chapter 3, several factors influence trips that have at least one end outside of the model area. As part of the 2030 model update, the XX trip matrix was adjusted based on the results of the California Statewide Travel model. Using the 2000 and 2030 versions of the Statewide model, the growth in traffic at each of the external gateways was estimated. Using row-and-column factoring, the 2009 XX trip matrix was adjusted to account for this growth. Appendix G presents the 2009, 2020 and 2030 XX trip matrices.

The factors that influence the IX and XI trip distribution were also evaluated when developing the 2030 version of the TDF model. Under base year conditions, the majority of trips in Mendocino County are II trips. Considering the growth in Mendocino and neighboring counties between 2009 and 2030, it is not expected that the II, IX, or XI trip characteristics would change significantly.

## FORECASTS

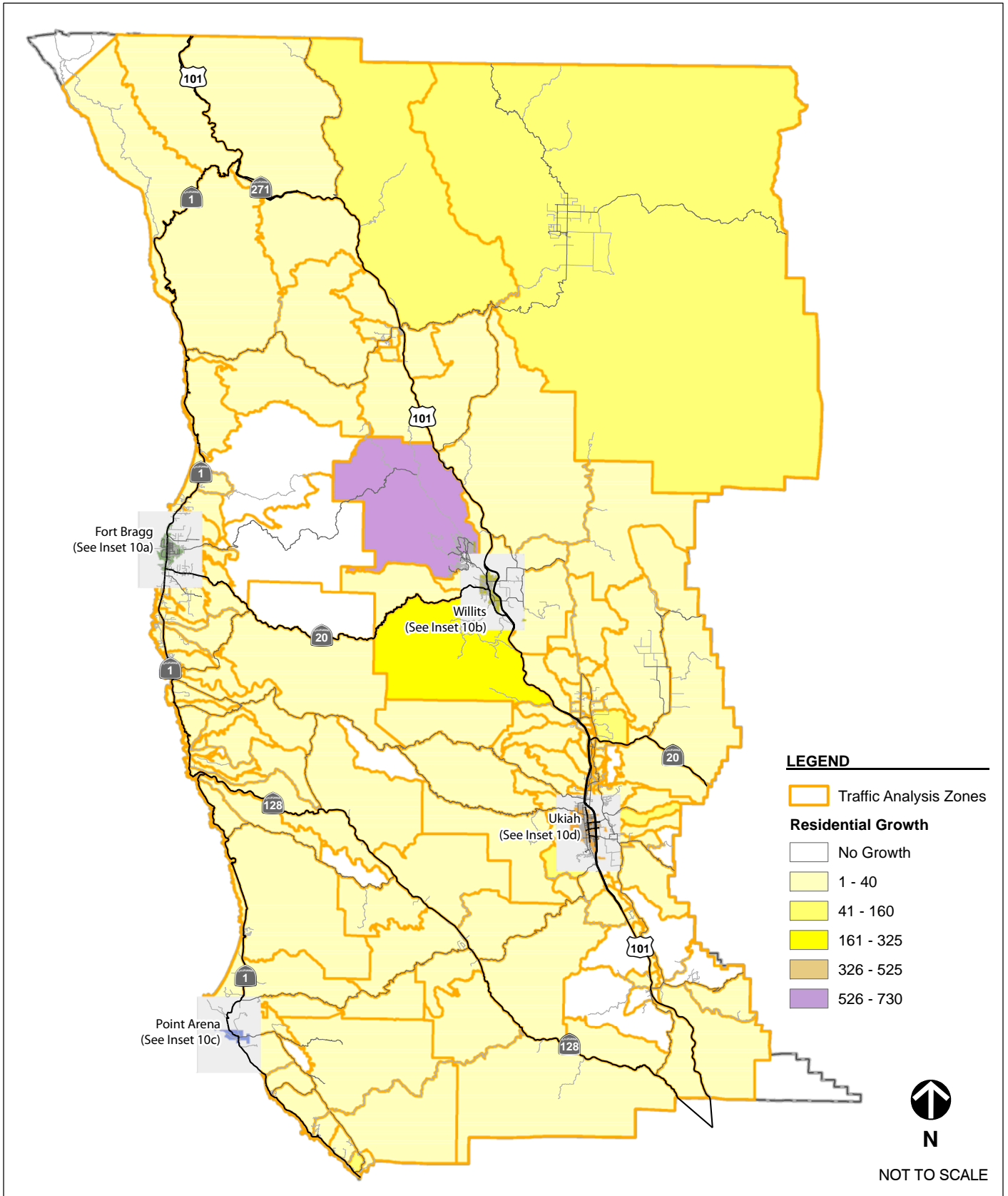
Figures 12 and 13 show the roadway volumes and volume / capacity ratios obtained by running the 2009 and 2030 models respectively. The model projects that most roadways in the County would continue to operate well within their capacities. A small number of roads exhibit volume-to-capacity ratios of 0.75 or greater in 2030, and thus could be considered important subjects for future planning efforts:

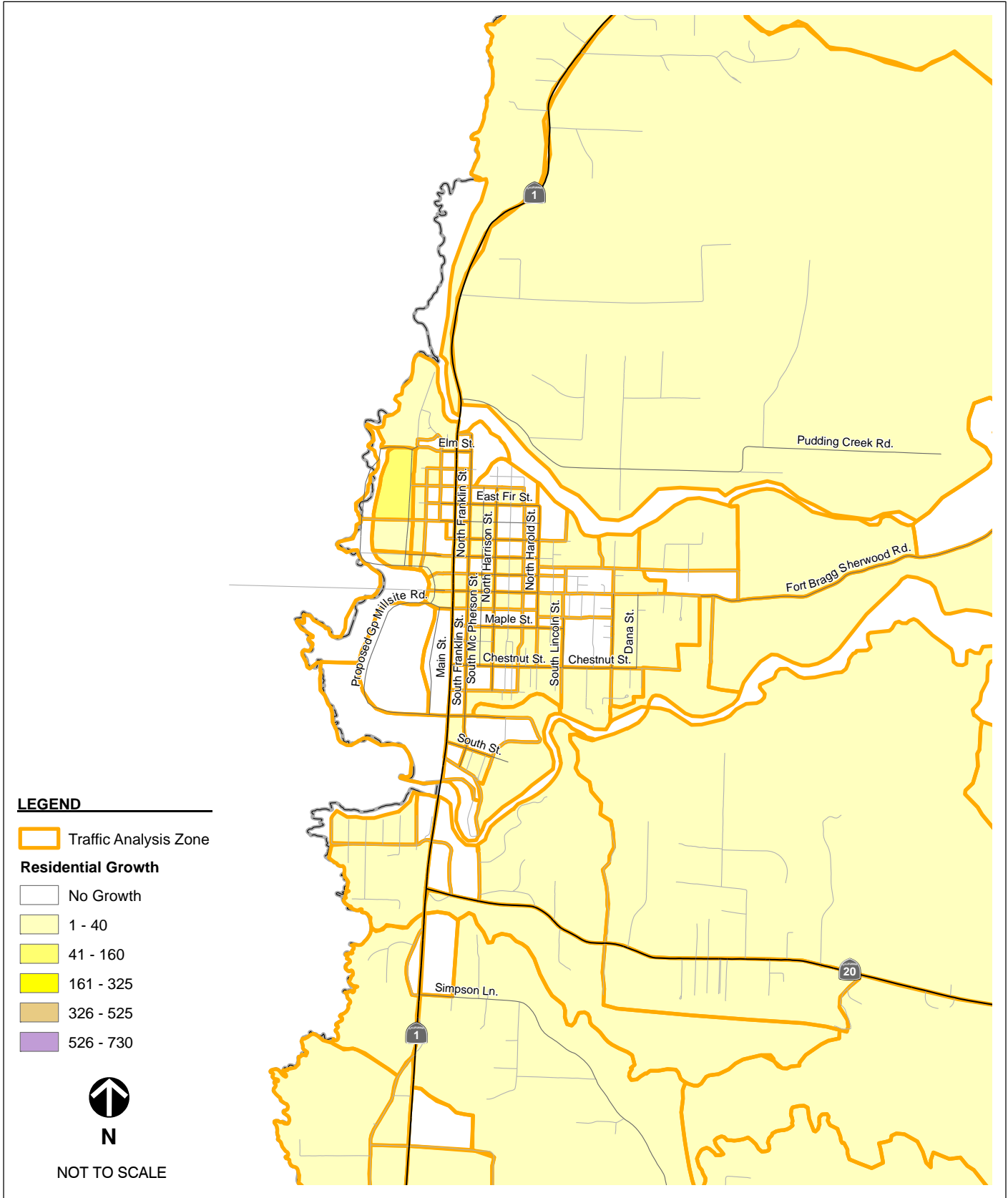
- North State Street near US-101
- Orchard Avenue extension north of Perkins Street
- Talmage Road (SH 222) near US-101
- SR 1 between SR 20 and downtown Fort Bragg

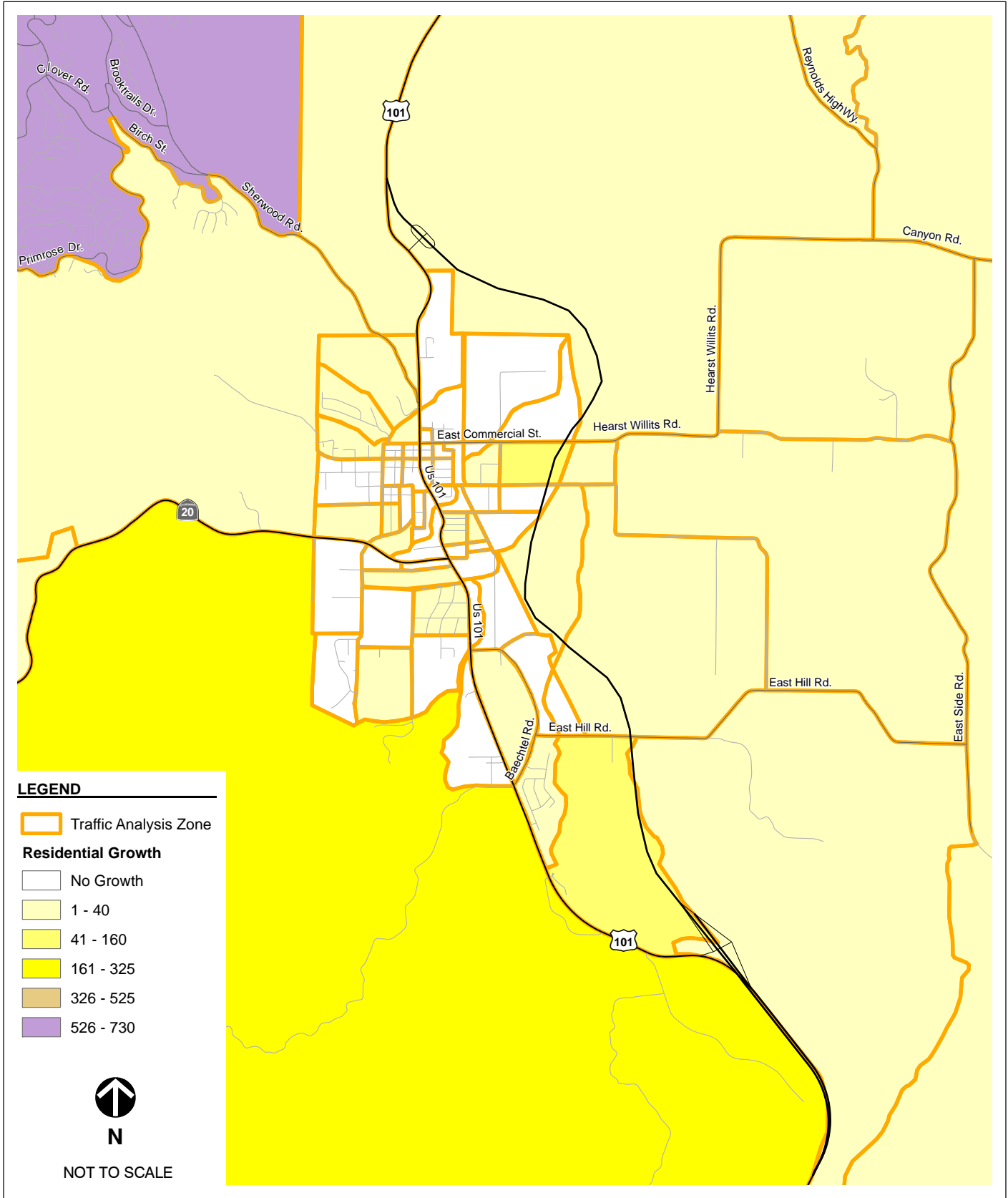
**TABLE 8 –  
ROADWAY IMPROVEMENTS INCLUDED IN THE FUTURE MODELS**

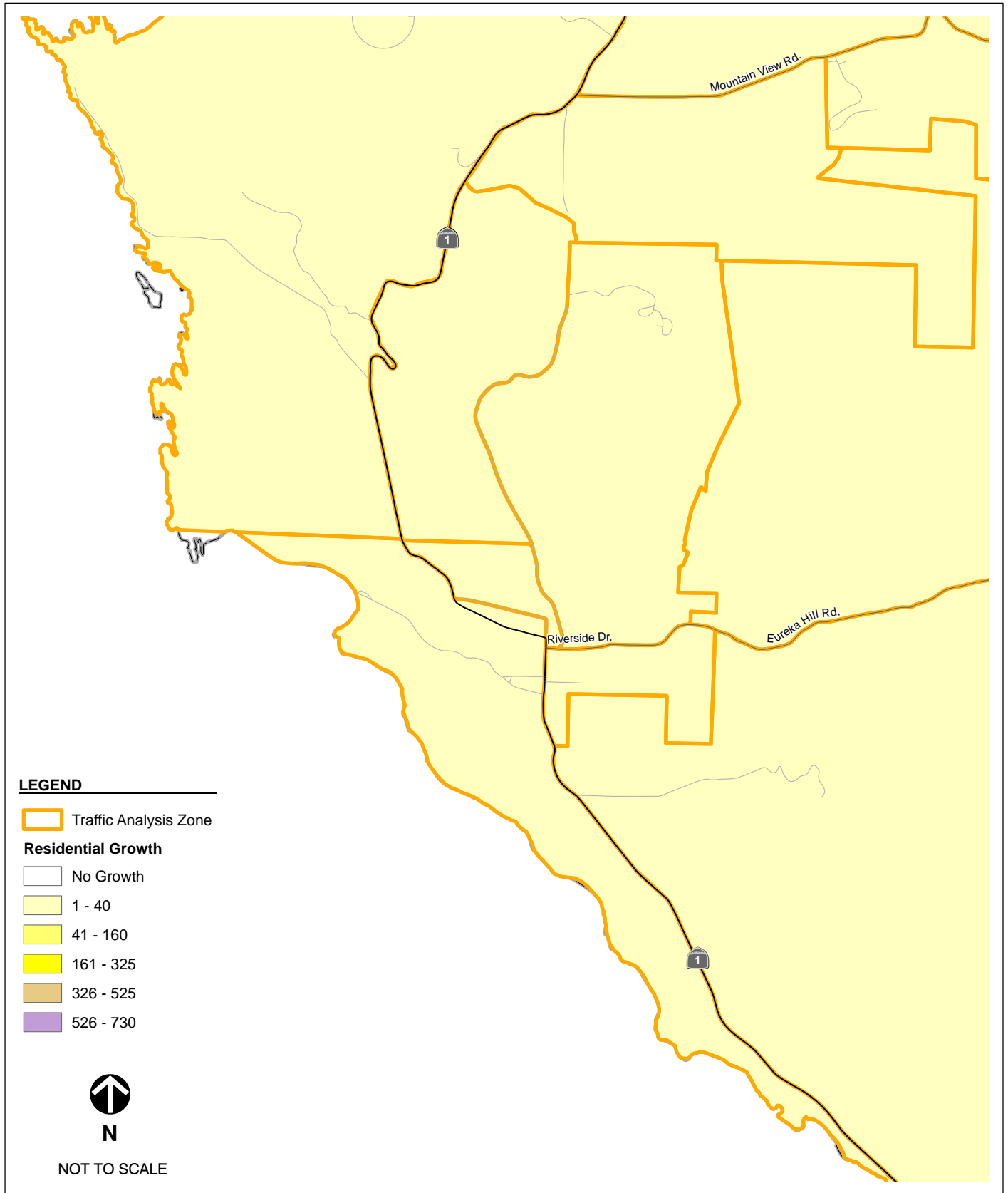
Roadway	City	Proposed Improvement	Year Built <sup>1</sup>
US 101 / Talmage Road (SR-222) Interchange	Ukiah	Reconfigure to partial cloverleaf interchange	2030
Orchard Avenue	Ukiah	Extend southward from current terminus to Talmage Road	2030
Clay Street	Ukiah	Extend eastward from Main Street to Leslie Street	2030
Orchard Avenue	Ukiah	Extend northward from Ford Street to Orr Springs Road	2020
Orchard Avenue	Ukiah	Extend northward from Orr Springs Road to Lake Mendocino Drive	2030
Orr Springs Road	Ukiah	Extend eastward from North State Street to Orchard Avenue Extension	2020
Hensley Creek Road	Ukiah	Extend eastward from North State Street to Orchard Avenue Extension	2030
North State Street	Ukiah	Widen from 2 to 4 lanes between US 101 and Lake Mendocino Drive	2020
Brush Street	Ukiah	Widen from 2 to 4 lanes between North State Street and Orchard Avenue Extension	2020
Willits Bypass	Willits	Construct a 2 lane bypass on US 101 with access about 0.2 miles south of Walker Road and 0.6 miles north of Casteel Lane	2020
Willits Bypass	Willits	Widen bypass to a 4 lane facility	2030
Brooktrails Development	Willits	Construct a second entrance point on US 101 near the northern access point to the Willits Bypass	2030
Railroad Avenue	Willits	Extend southward from its current terminus to Baechtel Road	2030
Pearl Drive	Fort Bragg	Extend Pearl Drive eastward to Simpson Lane	2030
Millsite Development Roads	Fort Bragg	Construct roadways to support the Millsite development on the west side of Fort Bragg	2030

1 – “2020” means the improvement is included in both the 2020 and 2030 roadway networks. Actual year of construction could be any time between 2009 and 2020. Similarly, “2030” means the improvement is included only in the 2030 network, and actual year of construction could be any time between 2021 and 2030.  
Source: Fehr & Peers, 2010.

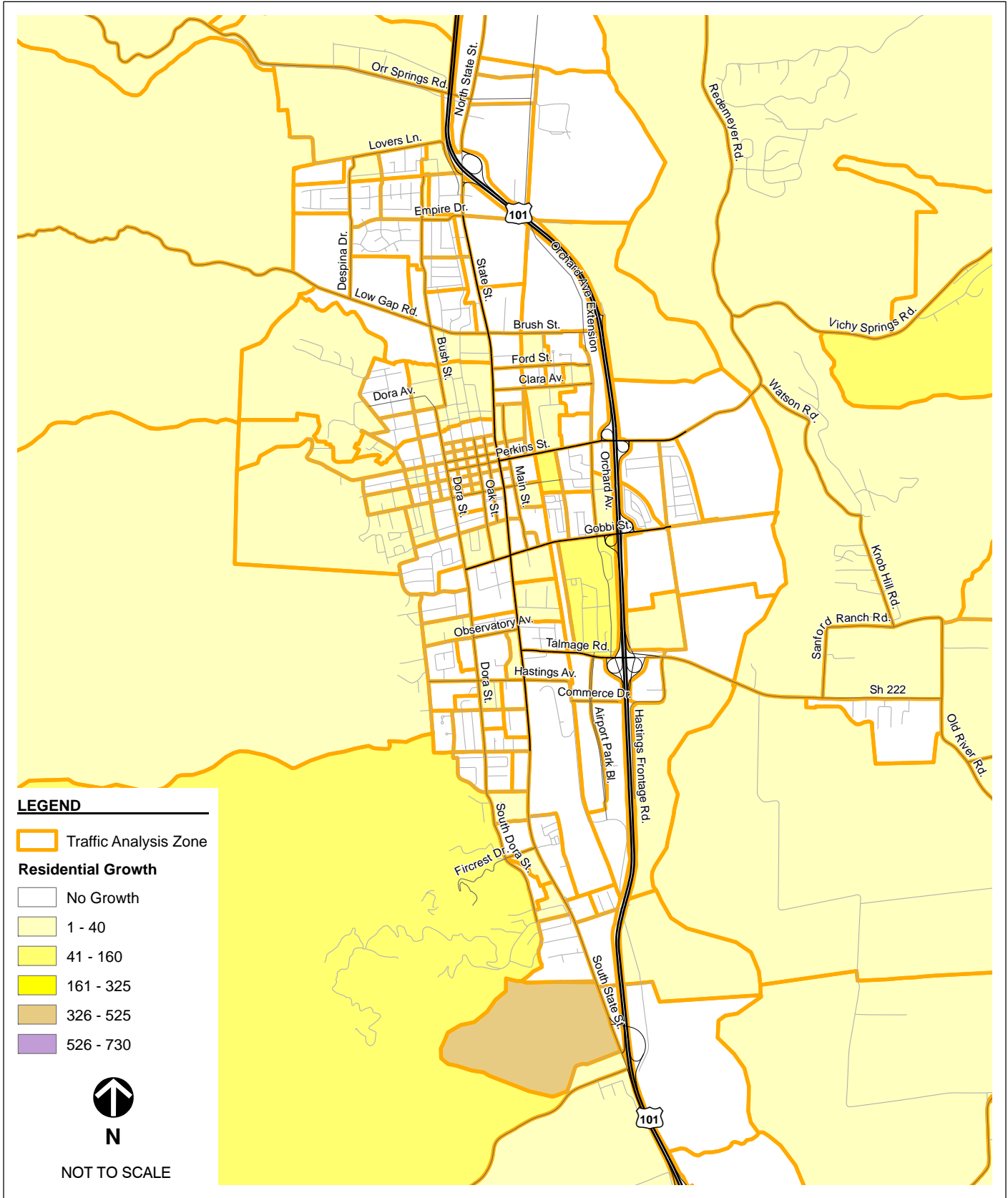


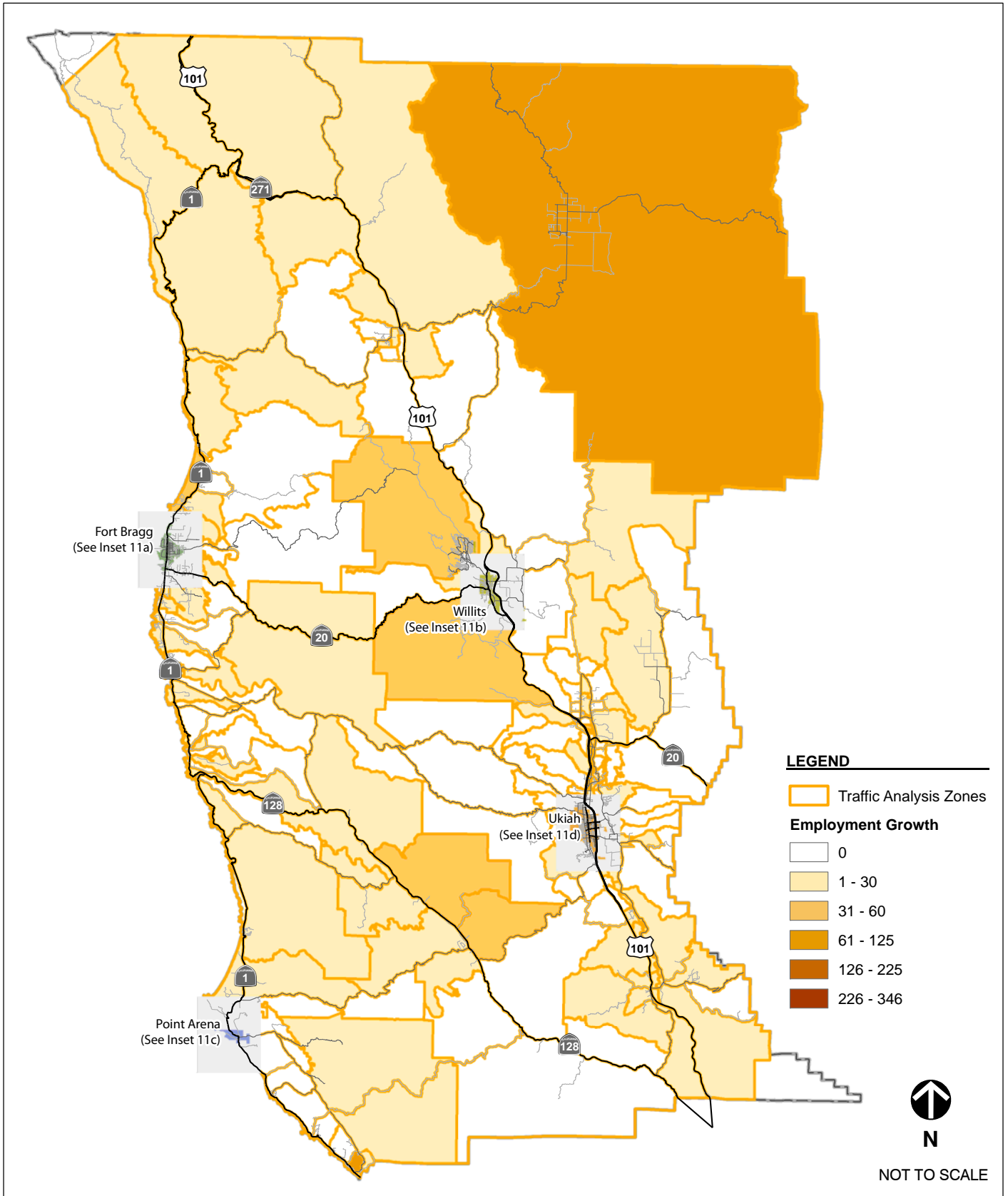


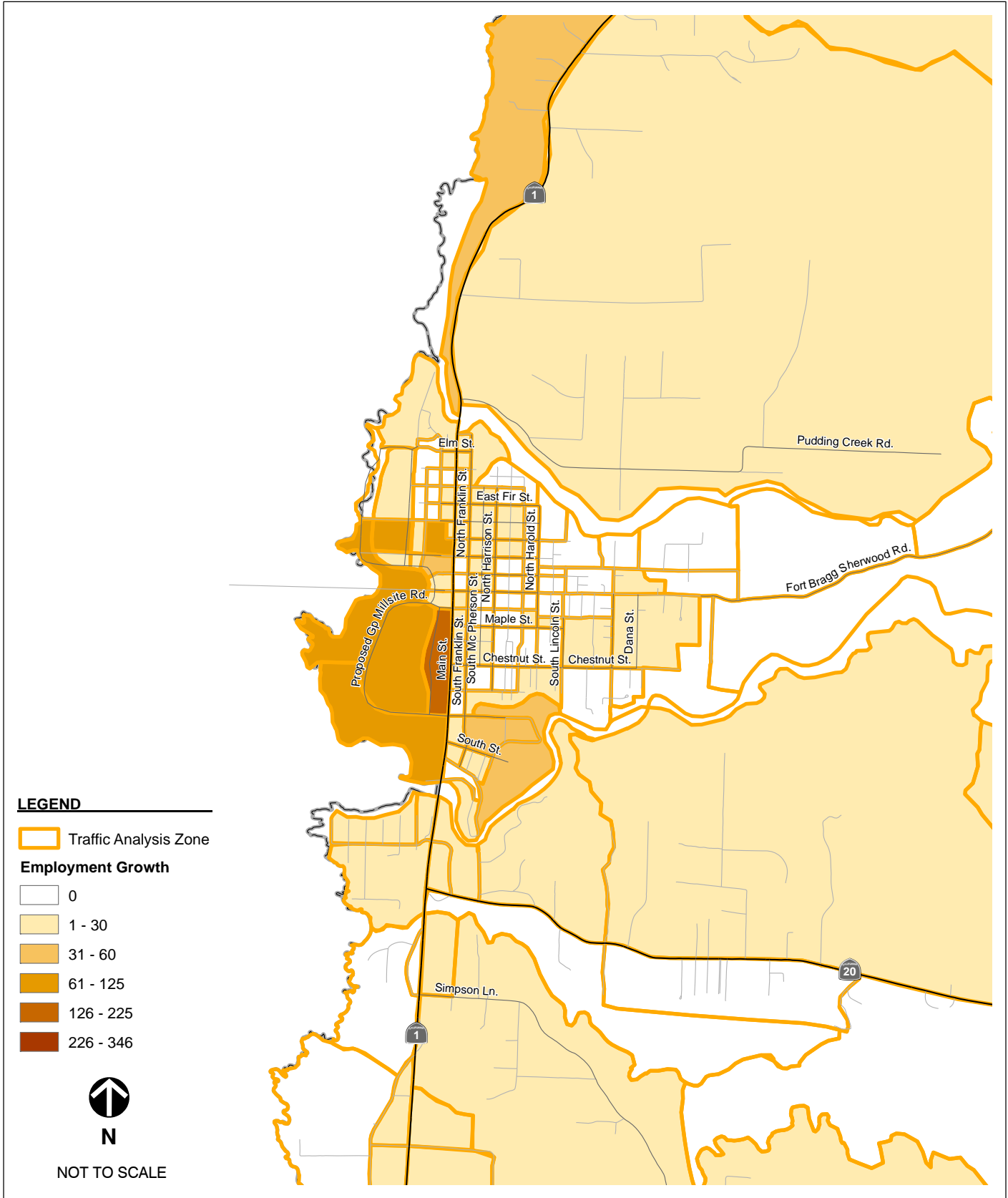


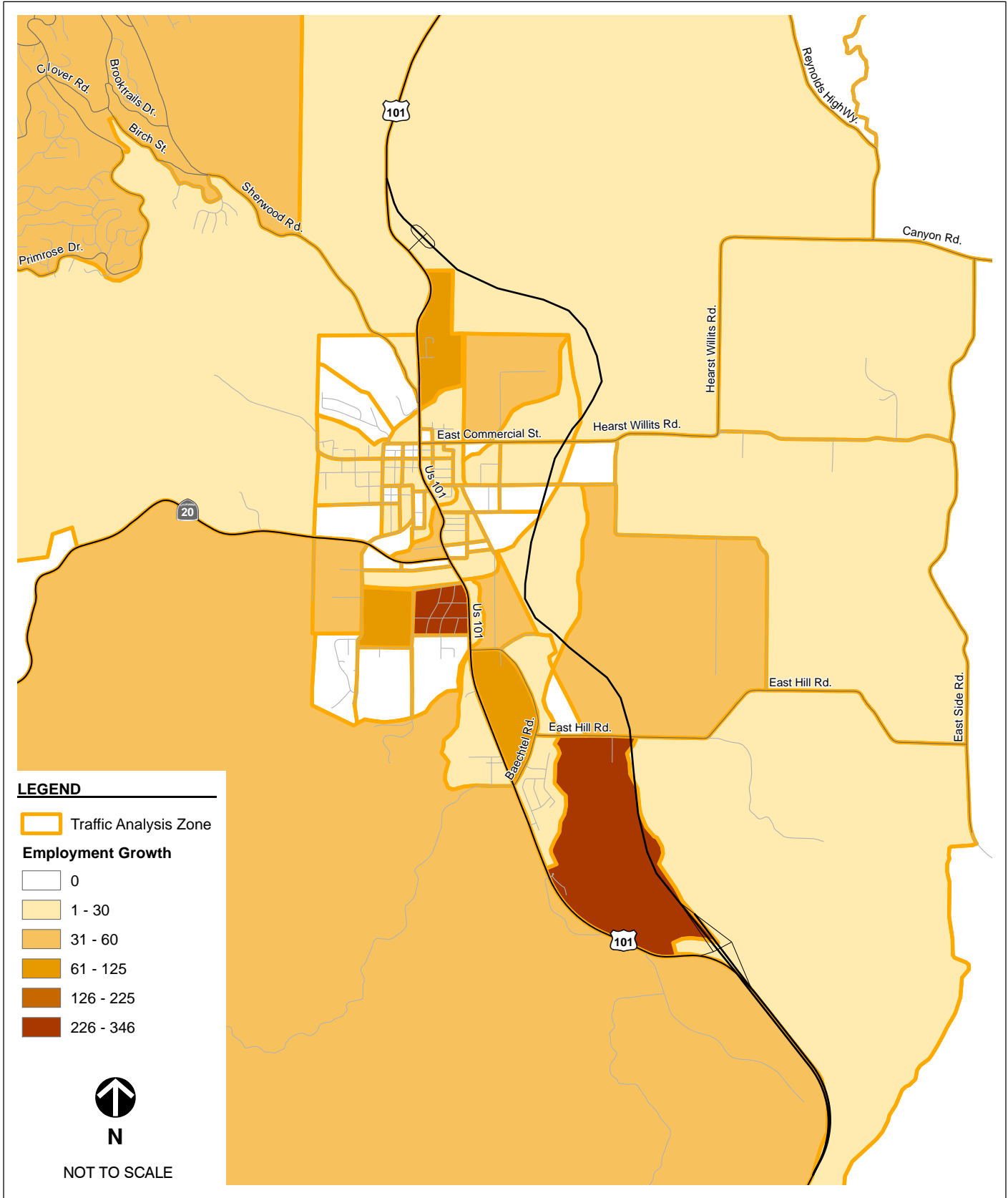


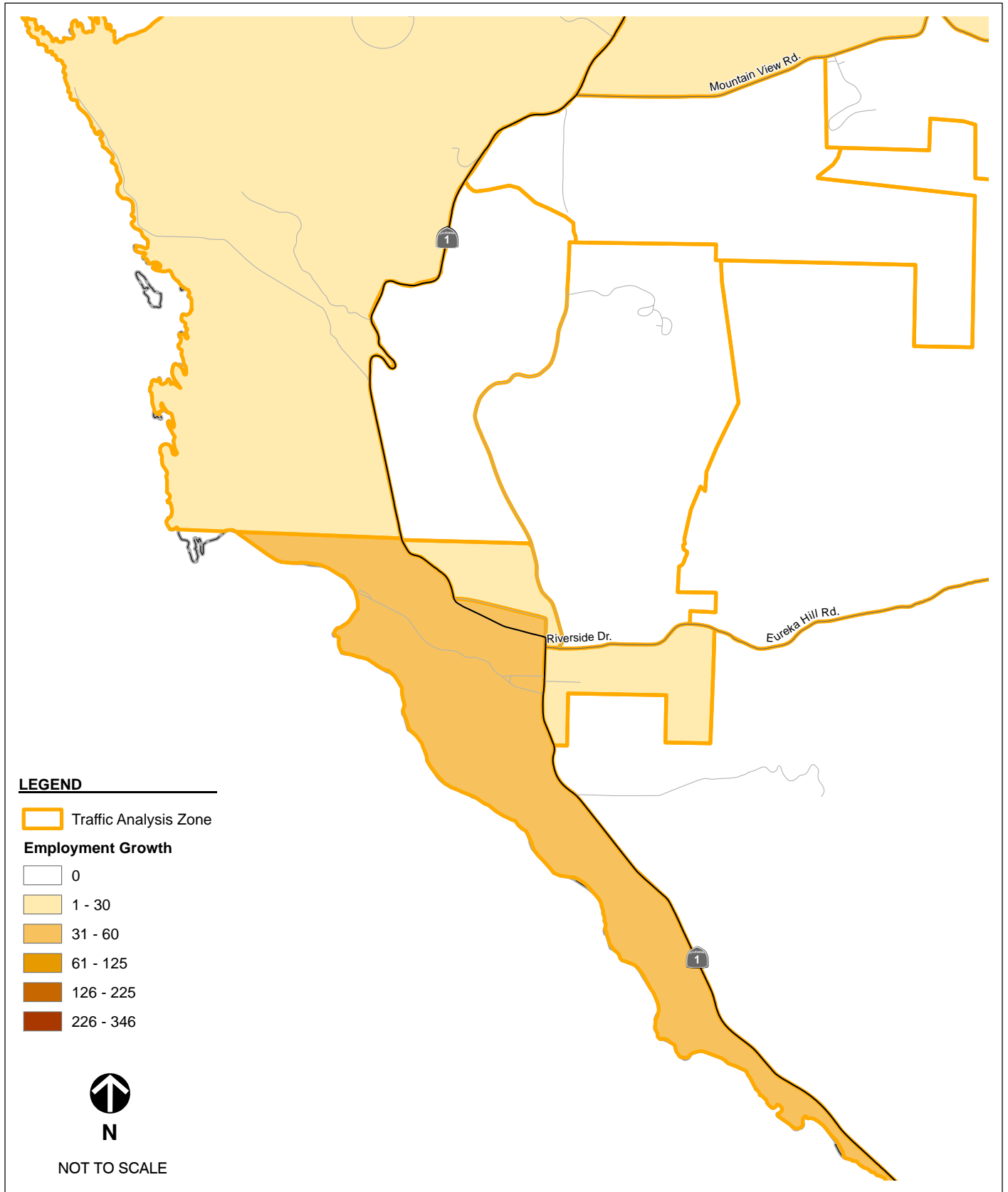


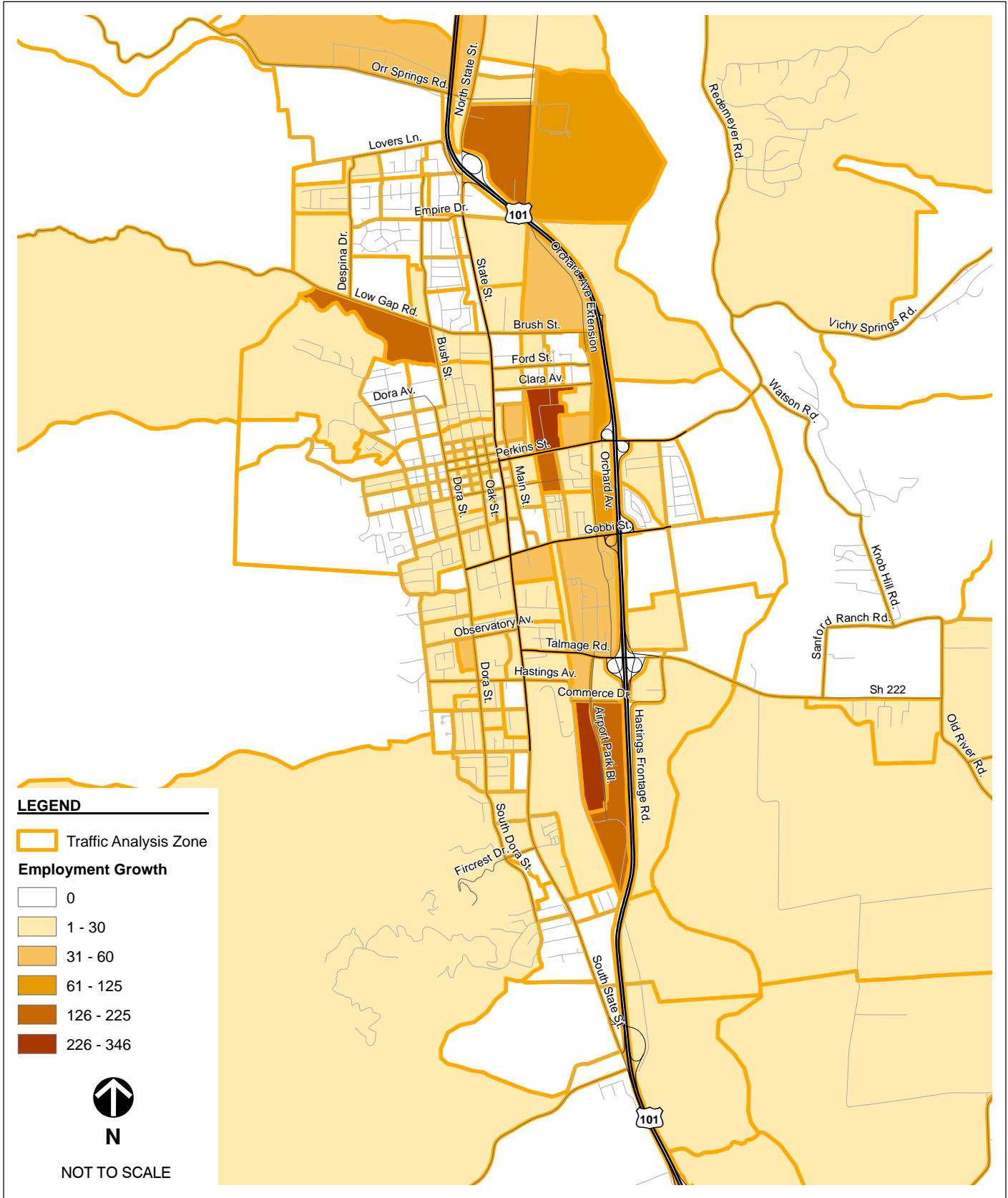


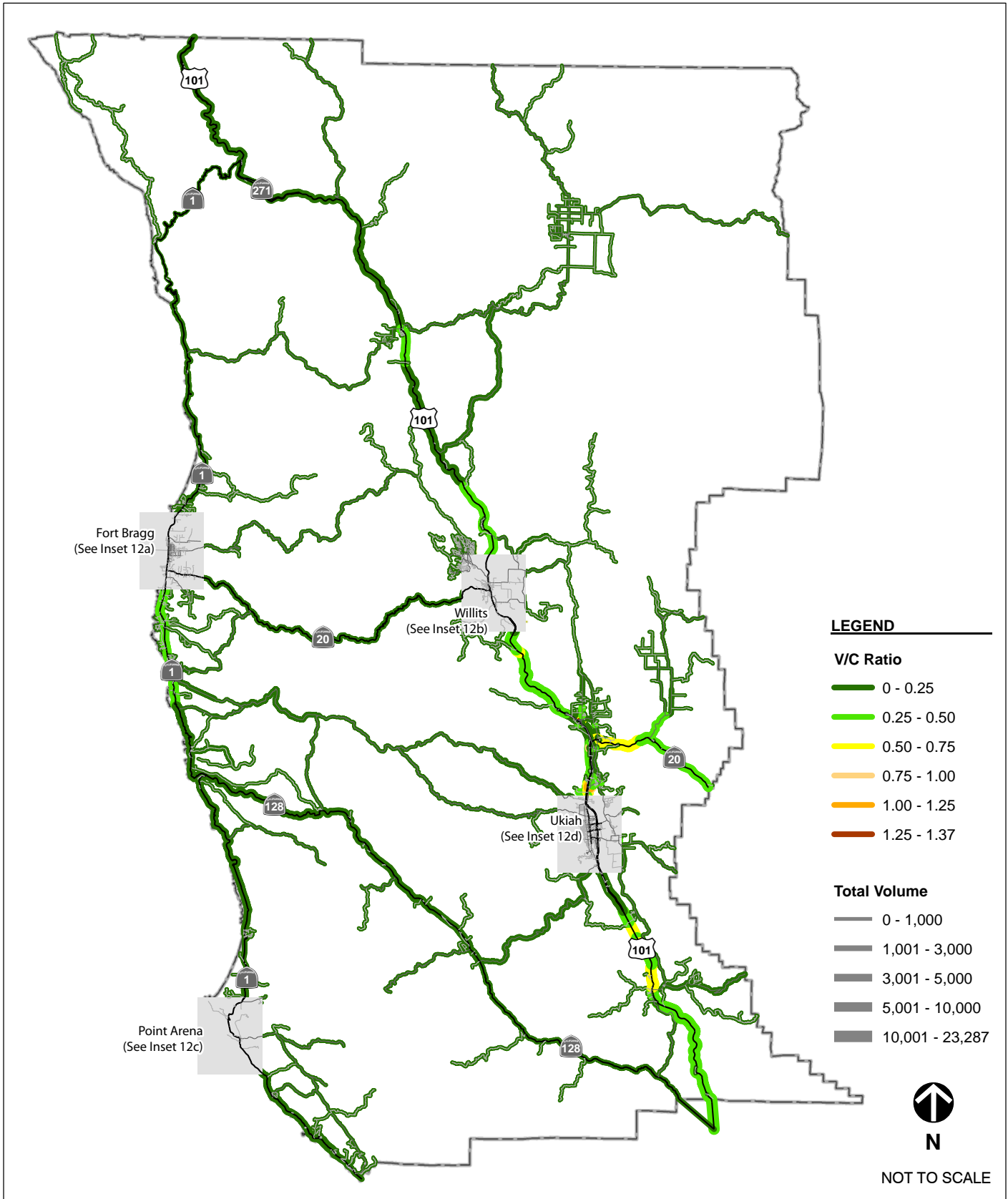




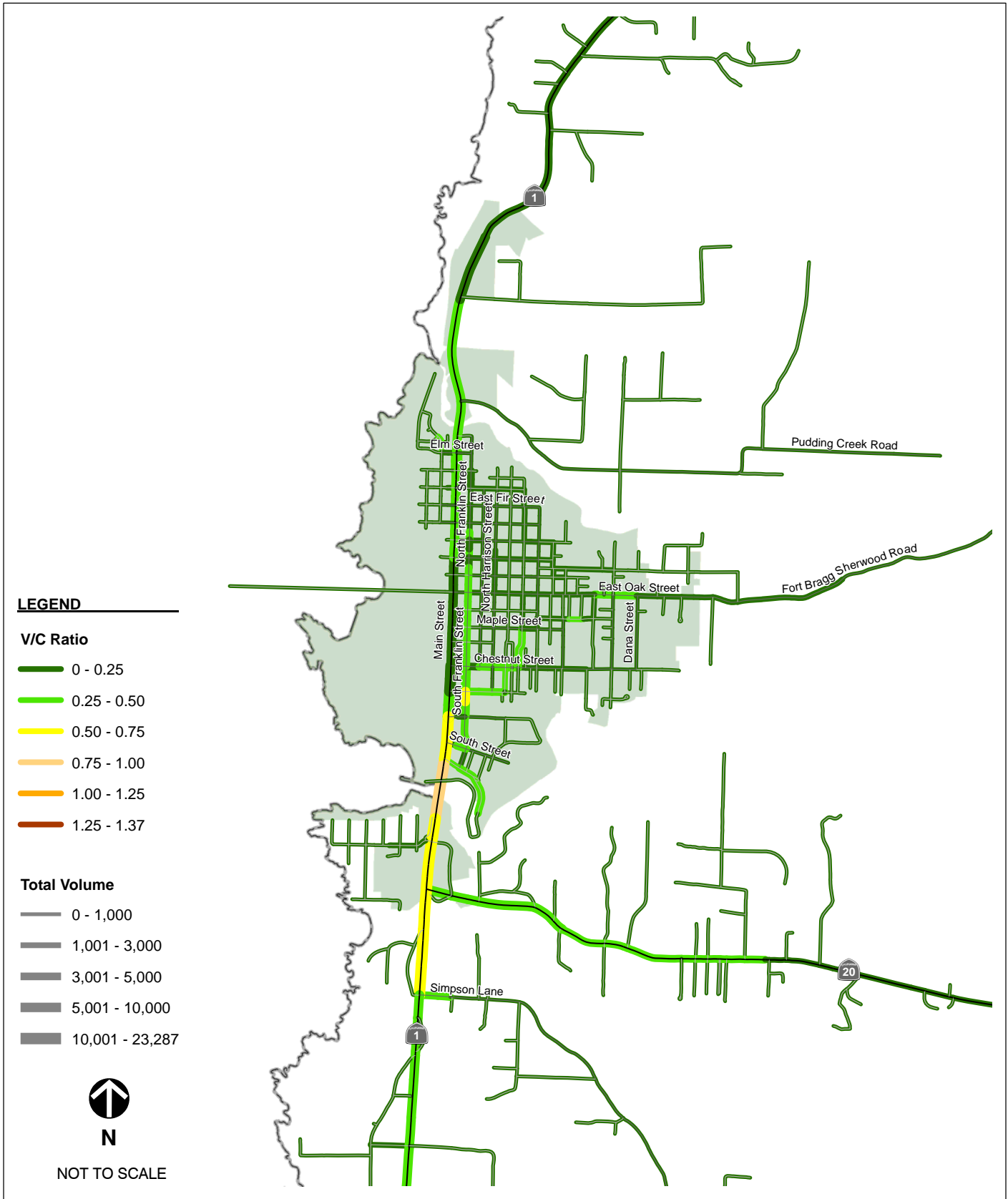




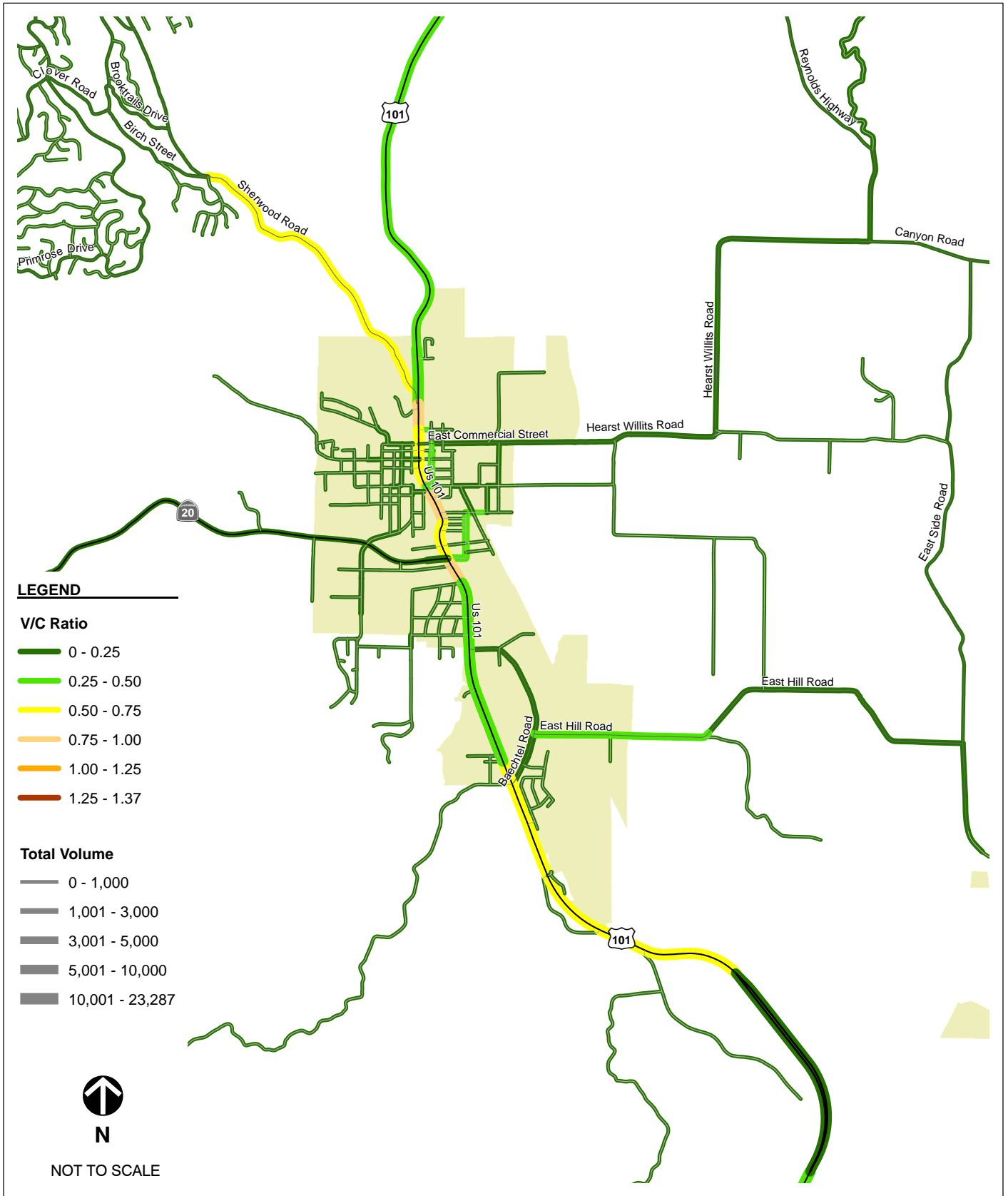


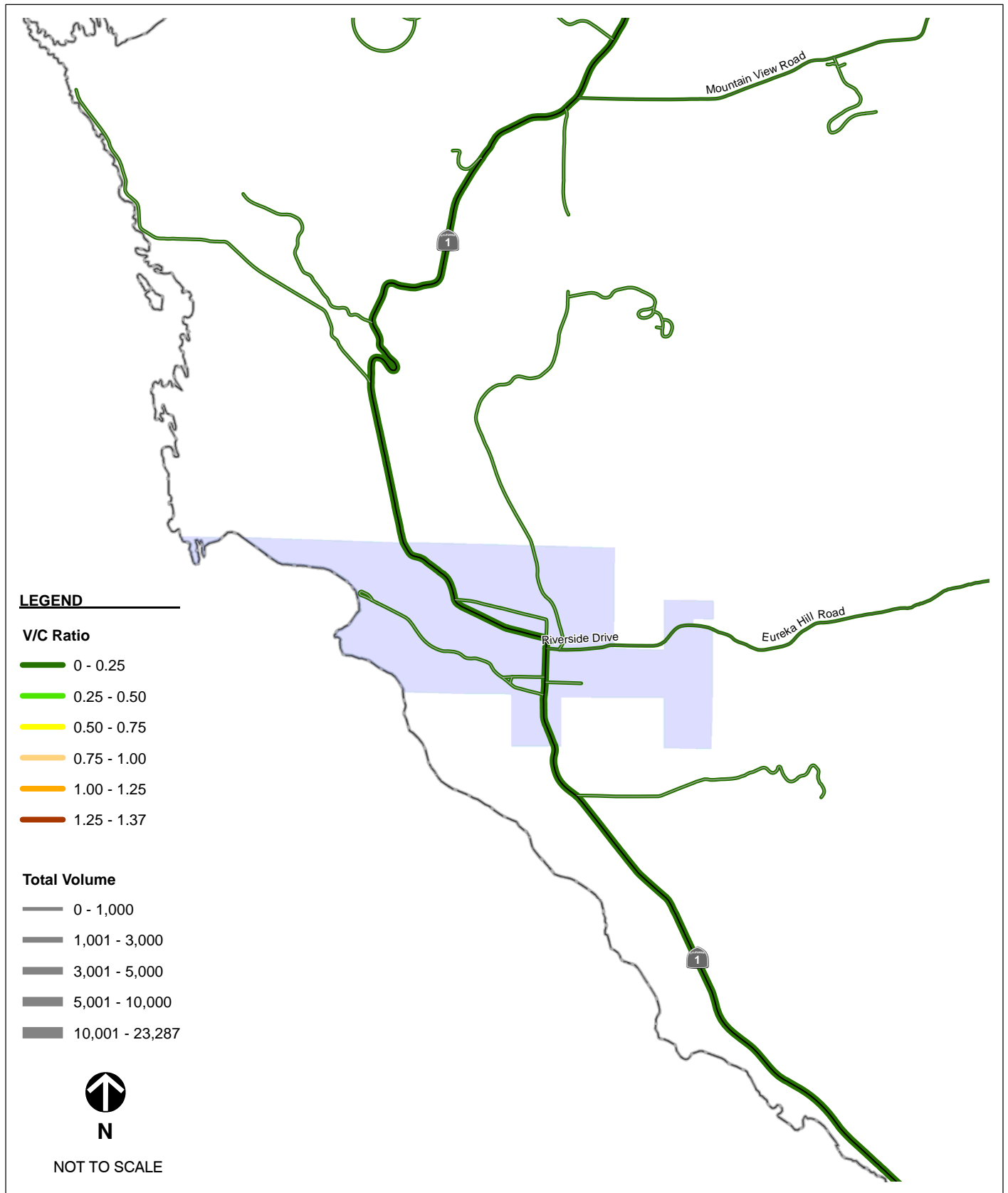


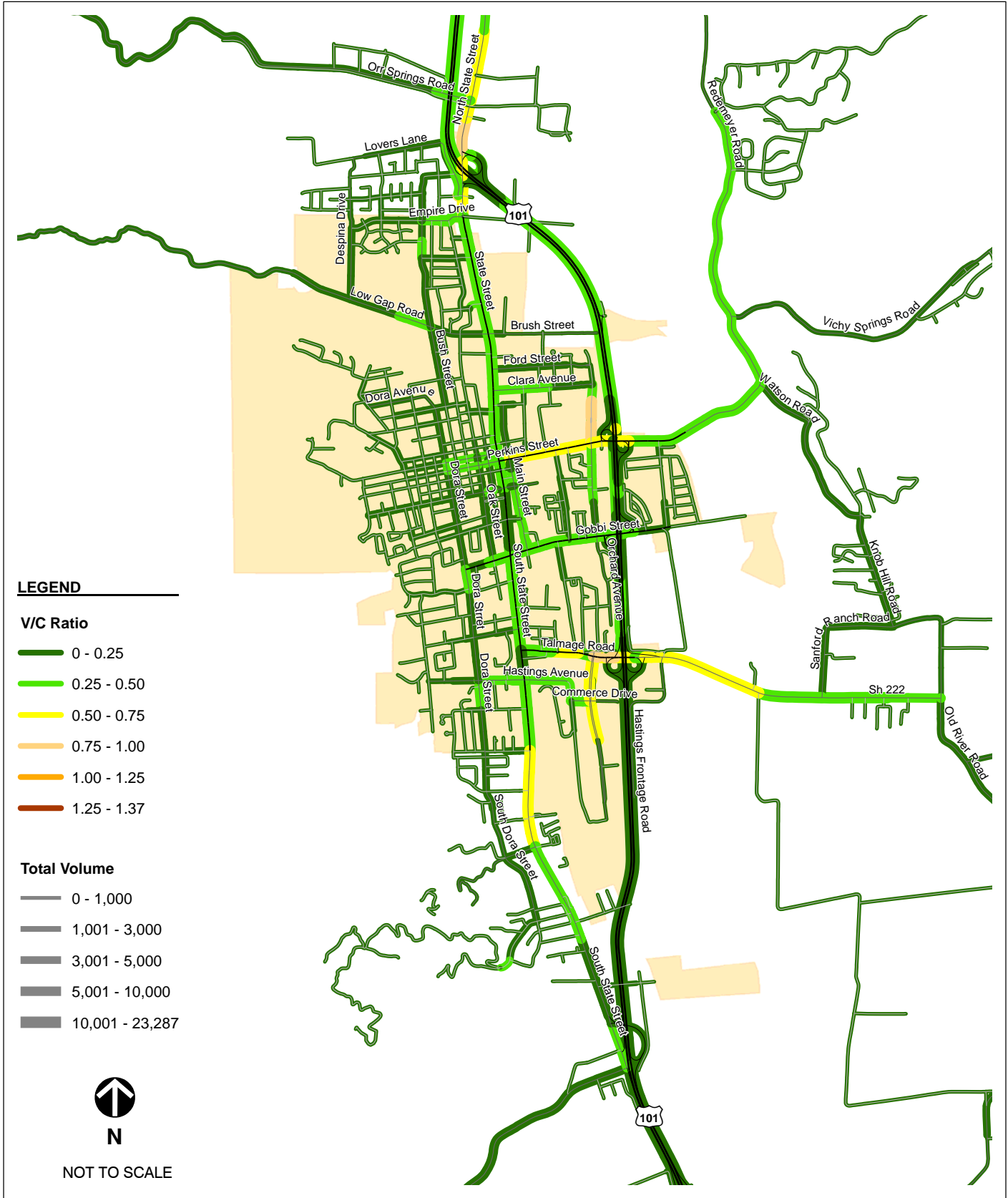


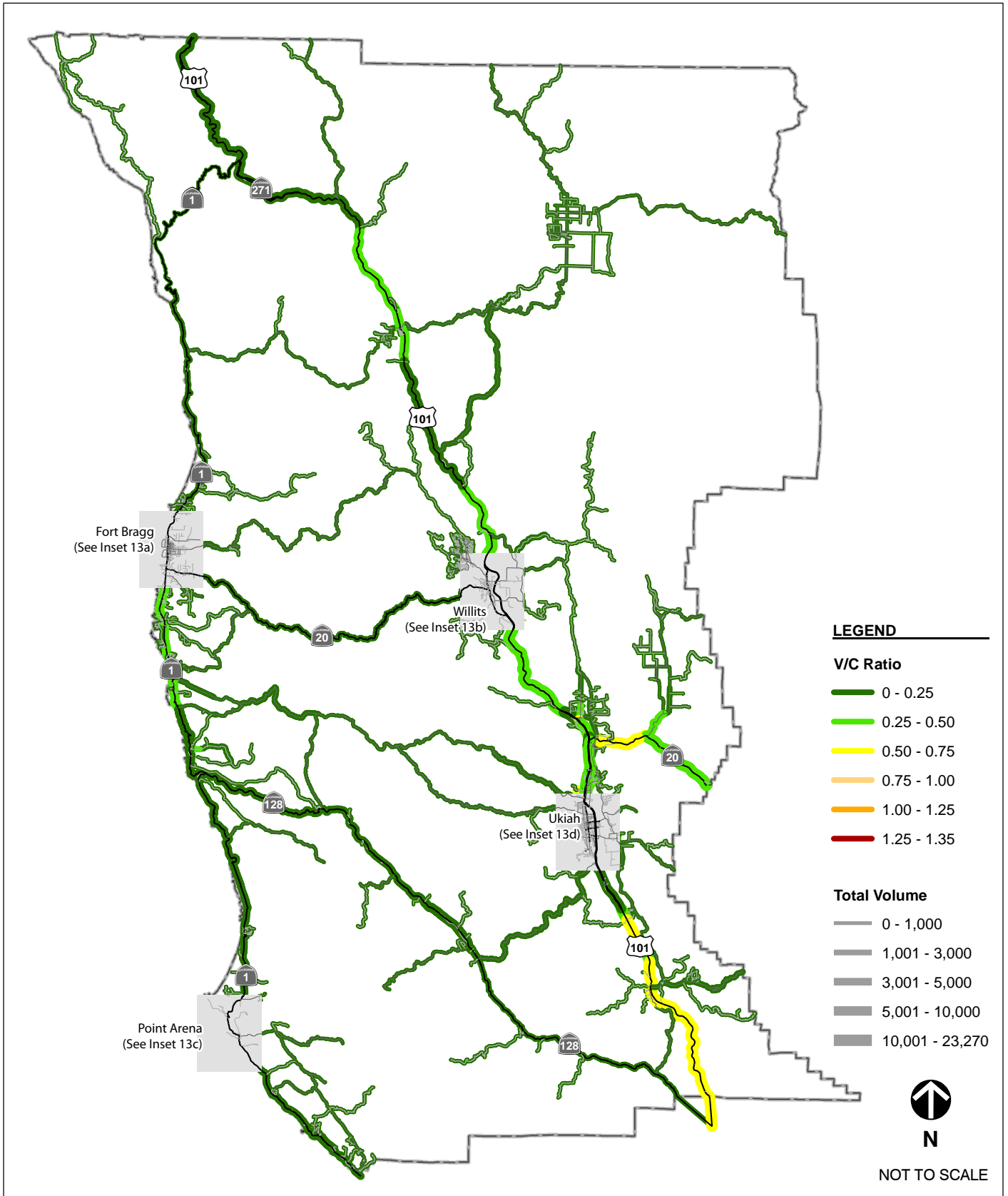


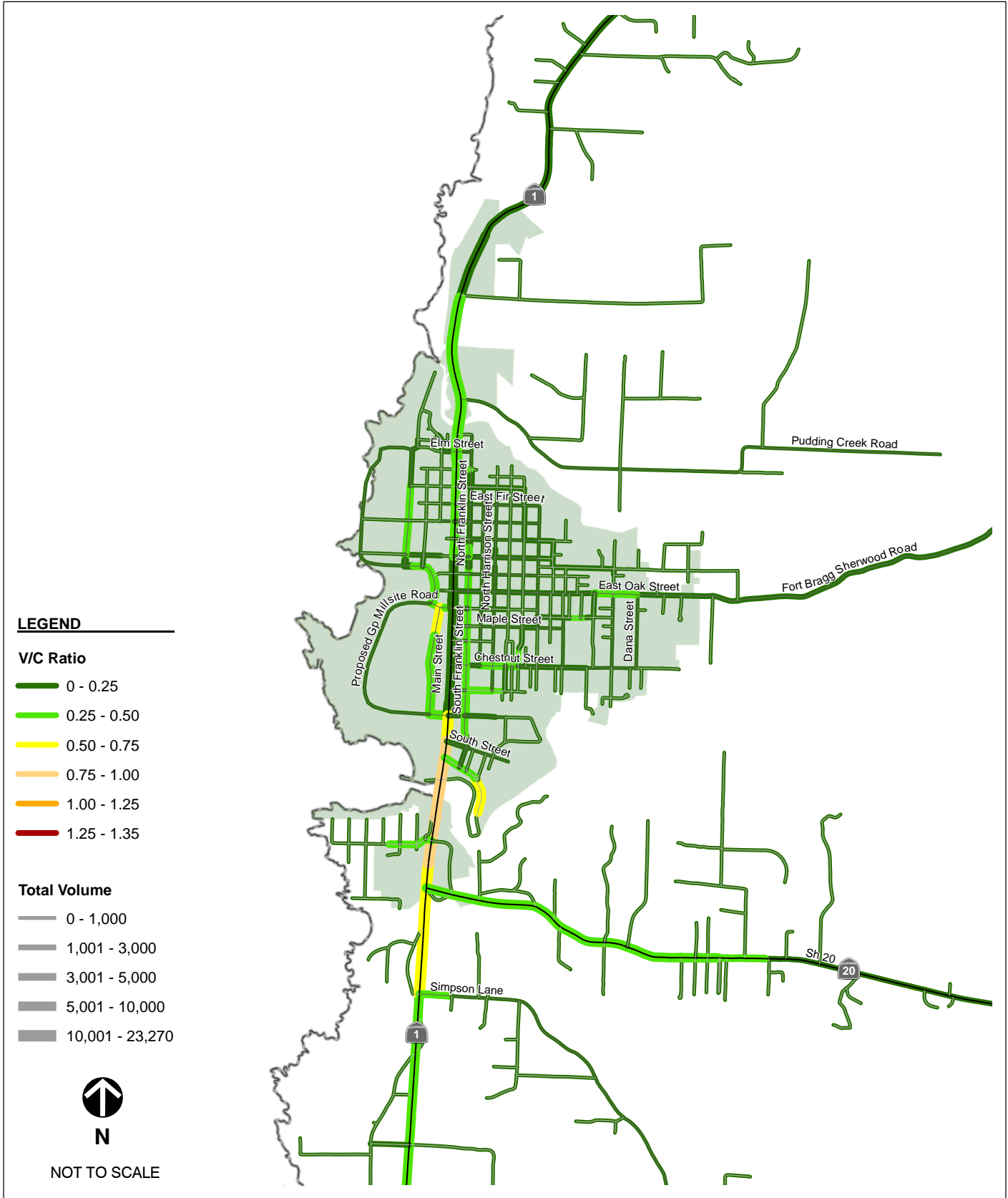


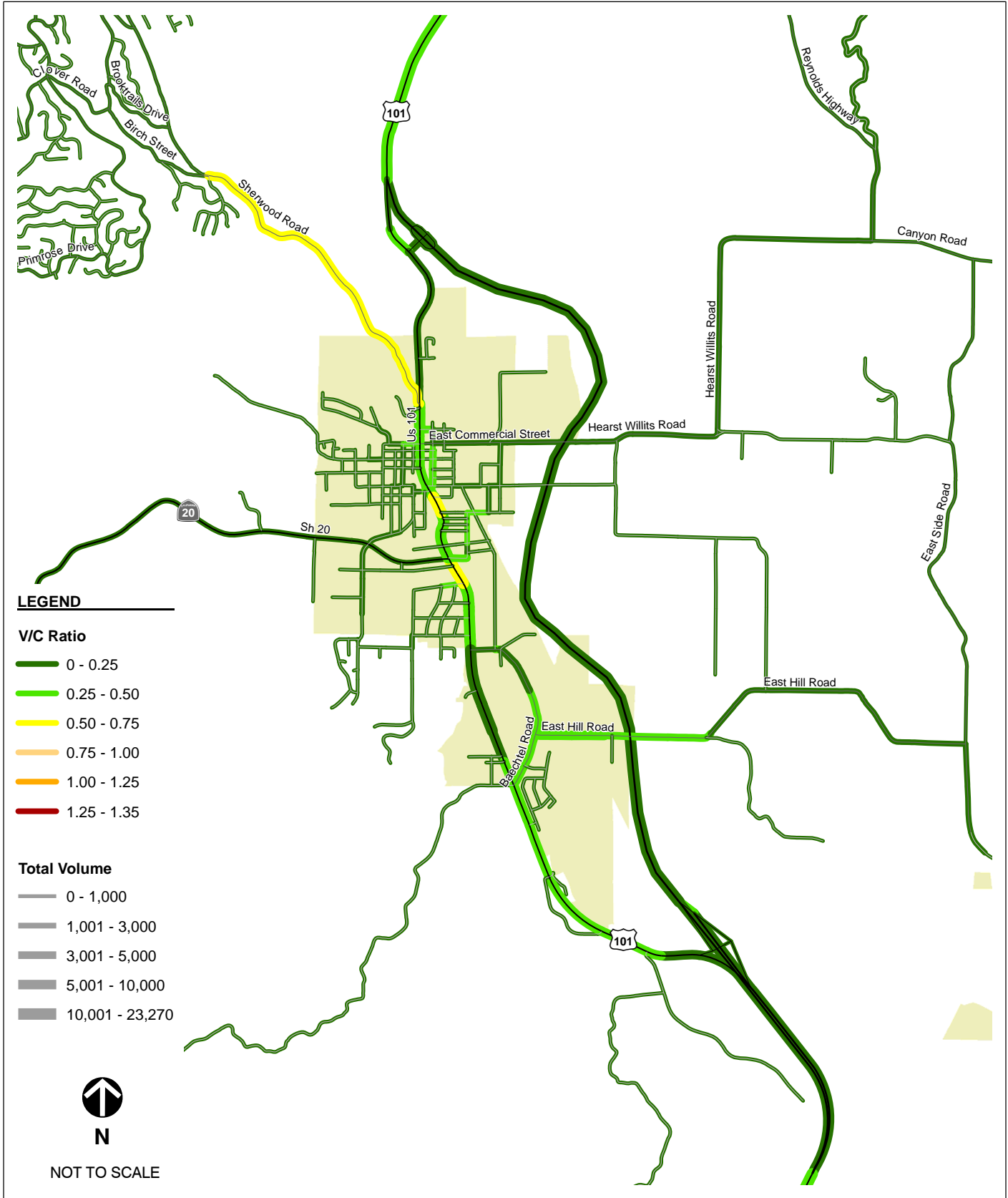


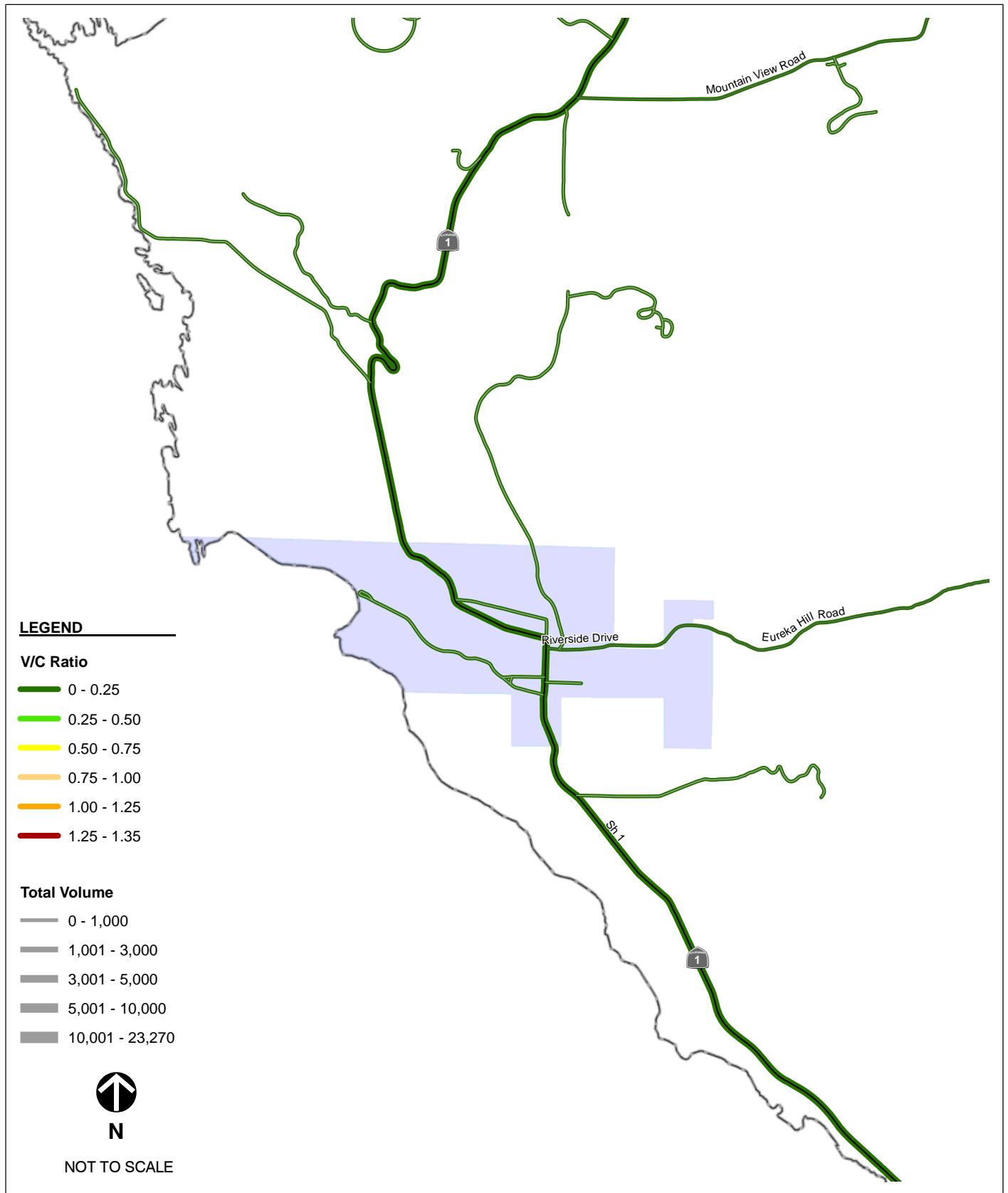




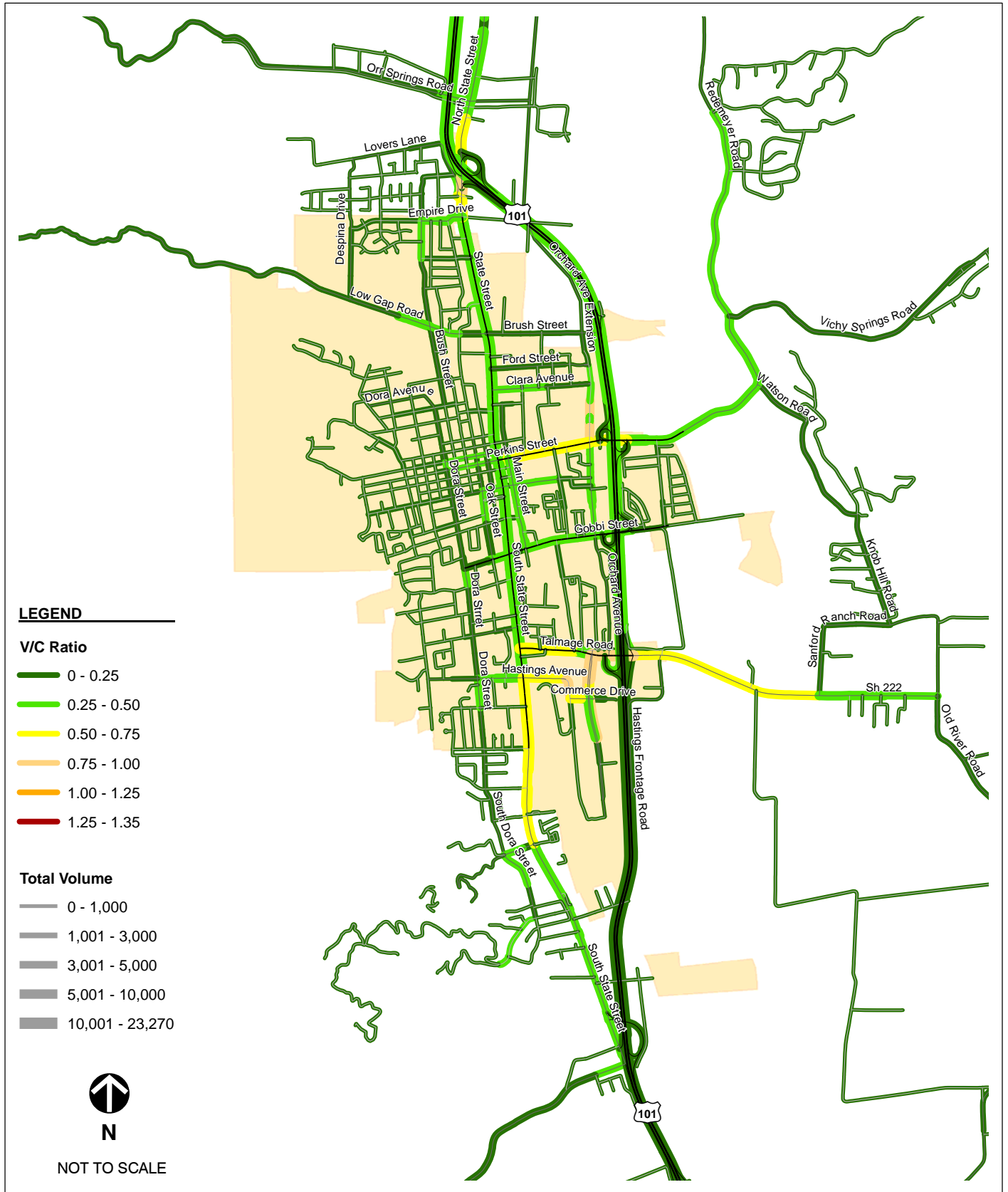














## 5. MODEL LIMITATIONS

Like all TDF models, the MCOG TDF model has limitations that are important to recognize when applying the model. This section describes these limitations.

### PRODUCTION AND ATTRACTION BALANCING

Three-step TDF models like the MCOG model develop trip production and trip attraction estimates in the Trip Generation stage of the model run. The final part of the Trip Generation stage “balances” trip productions and attractions so there is one trip attraction for each trip production. In general, trips are balanced to the home end of the trip (i.e., home-based work attractions are balanced to match home-based work productions).

When the MCOG TDF model was calibrated, the overall trip production and trip attraction rates roughly balanced. Additionally, in the 2030 version of the MCOG land use file, the proportion of residential to non-residential development is similar to base year proportions, so future year productions and attractions also roughly balance.

Trip production and attraction balancing can become an issue in model application when land use is added and the proportion of residential and non-residential uses is not kept in balance. This often happens when evaluating the effects of large developments like specific plans. For example, a large shopping center may be evaluated by adding the land use to the TDF model land use file. However, if a sufficient number of new homes are not also added to support the shopping center, then the effective trip generation rate at the shopping center may be lower than expected since the model balances home-based other (e.g., shopping trips) to productions, which are at the home end of the trip. Conversely, if a large residential specific plan is added without any supporting employment uses like offices and manufacturing, the new homes could lead to an unexpected increase in trip generation at nearby employment uses; again, because the model balances home-based work trips to productions, which are at the home end of the trip.

When adding a significant amount of land uses to the future year version of the model, it is recommended that a dynamic validation test be performed to ensure that the model is producing reasonable results.

### SENSITIVITY TO THE BUILT ENVIRONMENT

As discussed earlier, this version of the MCOG TDF model includes a 3D enhancement, but it is currently not calibrated or enabled. Without this feature, the model is not sensitive to built environment variables like density, access to regional destinations, and diversity (e.g., how well land uses are mixed). Without this feature enabled, the model will tend to overstate the trip generation and vehicle-miles of travel related to smart growth/sustainable development projects.

### LOCAL RESIDENTIAL TRIP GENERATION RATES AND DWELLING UNIT OCCUPANCY

At the outset of the model development project, it was recognized that Mendocino County has a wide variety of communities and these communities vary in their socioeconomic makeup. This socioeconomic variation leads to differences in trip generation and household occupancy rates. For example, some areas may have more retirees (who tend to make fewer trips) and other areas may have a higher vacancy rate (related to vacation homes or other factors).

These variations can be captured through detailed local trip generation surveys and verification of home occupancy; however, these data were beyond the scope of this model development process. In general, the trip generation categories were used to capture the overall countywide variation in trip generation and occupancy. For example, as shown in Table 2a, rural areas were assumed to have lower trip generation rates than urban areas to reflect both lower overall trip generation and lower occupancy rates. In these areas the model was originally producing significantly more trips than were observed in the traffic counts. Since the rest of the model area was validating well, it was determined that the overall trip generation was too high in these areas, and reductions were applied. Future model enhancements may include local trip generation surveys at a variety of developments throughout the County, which would allow for a more refined set of trip generation rates that could be applied in each geographic subarea of the County.

# **Appendix A**

## **Frequently Asked Questions about Travel Demand Models**

**Mendocino Council of Governments (MCOG)  
Travel Demand Forecasting Model**

**October 2010**

**WC09-2631**

This appendix summarizes the answers to commonly asked questions related to Travel Demand Forecasting (TDF) models and Mendocino County's need for such a model.

### ***What is a Computerized TDF Model?***

A TDF model is a computer program that simulates traffic levels and patterns for a specific geographic area. The program consists of input files that summarize the area's land uses, street network, travel characteristics, and other key factors. Using this data, the model performs a series of calculations to determine the amount of trips generated, where each trip begins and ends, and the route taken by the trip. The model's output includes projections of traffic volumes on major roads.

### ***Why Do We Need a TDF Model?***

The MCOG model will be a valuable tool for the preparation of short- or long-range transportation planning studies and aid in determining the impacts to air quality from transportation projects. The TDF model will be used to estimate the average daily and peak hour traffic volumes on the major roads in response to future growth assumptions. Using these traffic projections, transportation improvements will be identified to accommodate traffic growth.

### ***How Do We Know if the Model is Accurate?***

To be deemed accurate for projecting traffic volumes in the future, a model must first be calibrated to a year in which actual land use data and traffic volumes are available and well documented. A model is accurately calibrated when it replicates the actual traffic counts on the major roads within certain ranges of error established in the "Travel Forecasting Guidelines", Caltrans, 1992 and it demonstrates stable responses to varying levels of inputs. The MCOG TDF Model has been calibrated to 2009 (base year) conditions using the county's parcel database and census data.

The ability of a TDF model to replicate traffic counts is known as model validation. Traffic counts at dozens of locations were compared with the base year daily, AM peak hour, and PM peak hour model projections to determine the model's accuracy.

### ***Is the MCOG TDF Model Consistent with Standard Practices?***

The MCOG TDF Model is consistent in form and function with the standard TDF models used in the transportation planning profession. The model includes a land use/trip generation module, a gravity based trip distribution model, and a capacity-restrained equilibrium traffic assignment process. The model utilizes the TransCAD Transportation GIS software, which is consistent with many of the models used by local jurisdictions in California and throughout the nation.

### ***How Can the TDF Model be Used?***

The TDF model can be used for many purposes related to planning and design of the region's transportation system. The following is a partial listing of some of the potential uses of the model.

- To evaluate the traffic impacts of area-wide land use plan alternatives
- To evaluate the shift in traffic resulting from roadway improvements
- To evaluate the traffic impacts of land development proposals
- To determine trip distribution patterns of land development proposals
- To support the development of transportation sections of EIRs
- To support the preparation of project development reports for Caltrans

# **Appendix B**

## **Base Year Land Use Data**

**Mendocino Council of Governments (MCOG)  
Travel Demand Forecasting Model**

**October 2010**

**WC09-2631**

TAZ	City	ATYPE	SEAS_ONLY	SF_DU	MF_DU	K8_STUD	HS_STUD	AD_STUD	HOTEL_RMS	IN JOB UNITS												
										AG_General	AG_WINERY	COM_High	COM_Medium	COM_Low	OFFICE	MEDICAL	ENT_HIGH	ENT_LOW	RESTAURAN	IND_Heavy	IND_Light	GOV_PUBLIC
1	Ukiah	5	0	2	0	0	0	0	69	0	0	0	0	0	1	0	3	0	0	0	0	29
3	Ukiah	5	0	0	0	0	0	0	0	0	0	190	7	0	0	0	0	0	42	0	0	0
5	Ukiah	5	0	0	0	0	0	0	0	0	0	83	33	0	0	19	0	0	10	0	0	0
6	Ukiah	5	0	10	4	0	0	0	0	0	0	0	58	3	0	677	0	0	0	0	4	0
7	Ukiah	5	0	0	0	0	0	0	0	0	0	0	1	0	48	0	0	0	0	0	2	4
8	Ukiah	5	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	21
9	Ukiah	5	0	0	0	0	0	0	0	0	0	0	8	21	18	0	0	0	0	4	0	36
10	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	85
11	Ukiah	5	0	0	0	0	0	0	0	2	0	0	4	10	39	0	0	0	10	3	17	0
12	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	20	3	0	0	0	0	0	0
13	Ukiah	5	0	1	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	0
14	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	Ukiah	5	0	4	11	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
16	Ukiah	5	0	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Ukiah	5	0	13	24	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
18	Ukiah	5	0	54	9	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	2	7
19	Ukiah	5	0	67	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
20	Ukiah	5	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
21	Ukiah	5	0	26	5	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	8	0
22	Ukiah	5	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
23	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	11	6	2	0	0	0	0	0
24	Ukiah	5	0	4	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
25	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	120	0	0	0	0	0	0	10
26	Ukiah	5	0	0	8	0	0	0	0	0	0	0	2	9	8	6	5	0	3	0	0	0
27	Ukiah	5	0	0	0	0	0	0	0	0	0	0	8	1	23	4	0	0	25	0	1	0
28	Ukiah	5	0	0	0	0	0	0	0	0	0	0	1	1	11	0	0	0	23	0	0	0
29	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	6	6	7	0	0	0	10	81
30	Ukiah	5	0	12	62	0	0	0	0	0	0	0	9	0	32	0	3	0	0	0	35	0
31	Ukiah	5	0	0	0	0	0	0	0	0	0	0	14	7	156	25	3	0	18	2	5	59
32	Ukiah	5	0	3	0	0	0	0	0	0	0	0	4	0	12	10	0	0	0	0	20	11
33	Ukiah	5	0	3	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	7
34	Ukiah	5	1	4	8	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
35	Ukiah	5	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	Ukiah	5	1	31	57	0	0	0	0	0	0	0	0	10	6	0	0	0	0	0	0	0
37	Ukiah	5	0	28	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1
38	Ukiah	5	0	55	6	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	2	0
39	Ukiah	5	0	39	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0
40	Ukiah	5	0	153	36	0	0	0	20	0	0	0	3	0	12	20	3	1	10	3	14	21
41	Ukiah	5	0	6	62	0	0	0	0	0	0	0	2	0	32	8	0	0	54	7	14	0
42	Ukiah	5	0	11	59	0	0	0	0	0	0	0	2	1	5	5	0	0	0	0	0	0
43	Ukiah	5	0	20	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
44	Ukiah	5	0	18	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	Ukiah	5	0	11	96	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
46	Ukiah	5	0	68	116	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
47	Ukiah	5	0	8	24	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0
48	Ukiah	5	0	13	15	0	0	0	0	0	0	10	8	53	76	15	9	0	5	0	47	0
49	Ukiah	5	0	58	35	0	0	0	0	0	0	0	0	1	10	11	0	0	7	0	2	15
50	Ukiah	5	0	47	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
51	Ukiah	5	0	103	5	638	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
52	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	Ukiah	5	0	12	0	458	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	8
54	Ukiah	5	0	97	86	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0
55	Ukiah	5	0	2	0	148	56	0	0	0	0	3	3	38	0	7	0	0	0	0	131	0
57	Ukiah	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	Ukiah	5	0	1	0	143	70	0	0	0	0	20	5	9	33	4	13	0	118	0	66	5
60	Ukiah	5	0	134	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	2	1	0
61	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	5	0	2	0	0	0	0	16	0
62	Ukiah	5	0	130	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
63	Ukiah	5	0	0	0	0	0	0	57	0	0	0	6	3	35	0	1	0	8	0	19	0
64	Ukiah	5	0	191	97	0	0	0	0	0	0	0	0	13	3	0	3	0	1	2	13	0
65	Ukiah	5	0	106	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5
66	Ukiah	5	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
67	Ukiah	5	0	80	6	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4	0
68	Ukiah	5	1	90	71	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0
69	Ukiah	5	0	14	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	Ukiah	5	0	2	0	0	0	0	175	0	0	5	0	3	23	0	17	0	65	6	18	0
71	Ukiah	5	0	0	0	0	0	0	0	0	0	165	26	0	18	3	12	0	6	0	8	0
72	Ukiah	5	0	0	82	0	0	0	0	0	0	11	0	0	0	2	0	0	20	3	0	0
73	Ukiah	5	0	30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
74	Ukiah	5	0	66	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	Ukiah	5	0	0	0	0	0	0	0	0	0	4	48	3	6	8	0	0	80	0	7	0





TAZ	City	ATYPE	SEAS_ONLY	SF_DU	MF_DU	K8_STUD	HS_STUD	AD_STUD	HOTEL_RMS	IN JOB UNITS													
										AG_General	AG_WINERY	COM_High	COM_Medium	COM_Low	OFFICE	MEDICAL	ENT_HIGH	ENT_LOW	RESTAURAN	IND_Heavy	IND_Light	GOV_PUBLIC	
278	Ukiah	5	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
280	Ukiah	5	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
282	Redwood V	3	0	44	0	0	0	0	0	0	0	0	0	0	0	185	0	0	0	0	2	0	
284	Calpella	5	0	7	6	140	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
286	Redwood V	3	1	10	19	0	0	0	0	0	8	0	3	0	20	60	0	0	0	0	2	0	
288	Calpella	5	0	2	0	0	0	0	0	0	0	1	3	0	2	0	0	0	0	104	8	0	
290	Calpella	5	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
292	Ukiah	5	0	32	6	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
294	Ukiah	5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
296	Calpella	5	0	26	50	276	0	0	0	23	0	0	0	0	0	0	0	0	0	0	0	0	
298	Calpella	5	1	4	15	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	
300	Willits	3	0	34	20	0	0	0	0	0	0	0	0	0	0	27	0	0	0	0	0	0	
301	Willits	3	0	2	0	0	0	0	0	0	6	36	8	23	10	0	0	27	0	15	7	0	
302	Willits	3	1	14	154	0	0	0	0	0	0	0	0	5	0	0	0	0	0	5	3	0	
303	Willits	3	0	6	0	58	58	0	0	0	0	20	8	14	8	4	4	2	33	0	3	4	
304	Willits	3	0	13	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	73	
305	Willits	3	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	
306	Willits	3	0	42	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	
307	Willits	3	0	16	4	0	0	0	0	0	1	27	1	21	9	0	0	19	0	1	0	0	
308	Willits	3	0	11	7	0	0	0	0	0	0	0	0	2	9	1	0	0	0	0	0	0	
309	Willits	3	1	34	14	0	0	0	0	0	11	7	16	0	0	0	0	0	0	2	0	0	
310	Willits	3	0	21	14	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	
312	Willits	3	1	5	4	0	0	0	0	0	0	0	4	6	0	0	0	0	61	3	0	0	
314	Willits	3	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
316	Willits	3	0	9	0	0	0	0	0	0	0	0	0	7	16	4	0	0	4	0	66	0	
318	Willits	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	
320	Willits	3	0	1	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	11	24	5	
321	Willits	3	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
322	Willits	3	0	17	6	0	0	1030	0	0	0	6	5	7	0	0	0	1	13	20	0	0	
323	Willits	3	0	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
324	Willits	3	0	22	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
325	Willits	3	0	39	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
326	Willits	3	0	20	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	2	0	0	
327	Willits	3	0	11	23	0	0	0	0	0	0	0	0	4	4	3	0	0	0	0	0	0	
328	Willits	3	0	36	8	0	0	0	20	0	0	30	0	2	8	0	0	39	0	1	0	0	
329	Willits	3	0	13	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
330	Willits	3	1	1	37	0	0	0	0	0	0	12	3	18	10	0	0	17	0	1	1	0	
331	Willits	3	0	20	9	0	0	0	3	0	0	1	0	4	2	0	0	0	0	4	0	0	
332	Willits	3	0	6	13	0	0	0	0	0	0	0	6	8	3	3	0	5	0	0	0	0	
333	Willits	3	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	
334	Willits	3	1	6	7	41	59	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	
336	Willits	3	0	95	0	0	0	0	0	0	0	0	0	3	60	0	0	0	0	0	0	0	
338	Willits	3	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
340	Willits	3	0	8	0	0	0	0	0	0	92	13	17	19	4	0	0	41	0	19	0	0	
341	Willits	3	0	3	4	0	0	0	73	0	0	0	0	3	44	11	0	18	2	21	0	0	
342	Willits	3	0	57	0	377	0	0	0	0	0	6	0	2	320	0	0	0	0	0	4	0	
344	Willits	3	0	58	57	0	0	0	20	0	0	0	0	11	0	0	0	0	0	0	0	0	
346	Willits	3	0	36	49	10	0	0	0	0	0	1	15	4	5	0	0	0	0	5	0	0	
348	Willits	3	0	49	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
350	Willits	3	0	42	38	0	0	0	0	0	0	0	0	4	0	90	0	0	0	0	0	0	
352	Willits	3	0	2	253	0	0	0	82	0	0	73	15	11	17	20	17	0	113	4	8	3	
354	Willits	3	0	27	25	0	0	0	87	0	2	4	35	12	9	7	0	28	10	58	11	0	
356	Willits	3	0	1	99	0	0	0	0	0	0	19	13	0	0	0	0	0	13	116	0	0	
358	Willits	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	0	0	0	
360	Willits	3	1	123	0	0	0	0	0	0	10	0	0	5	0	0	0	0	0	0	0	0	
362	Willits	3	0	7	0	0	0	0	0	0	0	2	33	0	0	0	0	0	0	29	0	0	
364	Willits	3	0	5	16	0	0	0	0	0	0	0	6	4	0	1	0	0	23	16	0	0	
366	Willits	3	0	104	10	0	0	0	0	0	0	1	12	0	0	0	0	0	0	1	2	0	
368	Willits	3	0	25	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
369	Willits	3	0	16	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
370	Willits	3	0	16	0	0	573	0	0	0	12	0	19	12	0	14	2	9	0	37	15	0	
372	Willits	3	0	6	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
374	Willits	3	0	30	0	0	0	0	0	0	1	0	0	9	1	0	0	0	0	0	0	0	
376	Willits	3	0	58	0	0	0	0	0	0	0	0	11	2	0	3	0	0	0	0	0	0	
378	Willits	3	0	165	0	11	0	0	0	0	2	0	0	5	13	0	0	0	2	3	0	0	
380	Willits	3	1	113	0	0	0	0	0	0	0	0	12	5	0	0	0	0	1	0	3	0	
381	Willits	3	14	523	0	48	12	0	30	0	0	6	8	2	23	0	1	0	2	1	25	85	
382	Willits	3	10	268	0	0	0	0	0	0	0	0	0	10	15	0	1	0	0	3	0	0	
384	Willits	3	0	5	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	
385	Willits	3	0	6	0	0	0	0	0	0	6	1	0	0	12	0	0	0	0	10	0	0	
386	Willits	3	0	38	0	0	0	0	0	0	0	0	0	3	4	0	0	0	9	4	0	0	



TAZ	City	ATYPE	SEAS_ONLY	SF_DU	MF_DU	K8_STUD	HS_STUD	AD_STUD	HOTEL_RMS	IN JOB UNITS												
										AG_General	AG_WINERY	COM_High	COM_Medium	COM_Low	OFFICE	MEDICAL	ENT_HIGH	ENT_LOW	RESTAURAN	IND_Heavy	IND_Light	GOV_PUBLIC
387	Willits	3	0	29	0	0	0	0	0	0	0	0	0	0	3	60	0	0	0	0	45	0
388	Willits	3	0	8	0	0	0	0	0	0	0	3	19	0	5	8	0	0	0	0	0	0
389	Willits	3	0	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
390	Willits	3	0	0	0	0	14	0	0	0	0	12	0	0	1	0	0	0	5	30	2	0
391	Willits	3	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
392	Willits	3	0	39	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
394	Willits	3	3	157	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
395	Willits	3	0	63	8	367	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	15
396	Willits	3	10	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
398	Willits	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	0	0
399	Willits	3	4	134	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
400	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	8	9	0	0	0	0	5	15	0
401	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	18	0	8	0
402	Ft Bragg	2	0	0	0	0	0	0	53	0	0	5	0	3	0	0	2	0	0	2	2	23
403	Ft Bragg	2	0	1	0	0	0	0	0	0	2	13	1	26	3	0	0	0	0	0	5	0
404	Ft Bragg	2	0	7	6	0	0	0	49	0	0	3	0	18	9	5	0	10	0	21	0	0
405	Ft Bragg	2	4	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
406	Ft Bragg	2	0	1	4	0	0	0	20	0	0	0	7	7	0	5	2	0	0	2	0	0
407	Ft Bragg	2	0	13	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
408	Ft Bragg	2	0	9	8	0	0	0	22	0	0	0	0	0	3	0	1	0	8	0	0	0
409	Ft Bragg	2	0	0	13	0	0	0	8	0	0	0	0	2	0	0	2	0	0	0	31	8
410	Ft Bragg	2	0	11	6	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
411	Ft Bragg	2	0	1	8	0	0	0	10	0	0	4	0	2	4	0	3	0	0	0	1	8
412	Ft Bragg	2	0	4	4	0	0	0	0	0	0	0	1	8	13	0	2	0	6	0	0	0
413	Ft Bragg	2	0	0	12	0	0	0	0	0	0	2	3	6	18	0	0	12	0	93	0	0
414	Ft Bragg	2	0	2	2	407	0	0	0	0	0	1	0	3	20	0	0	0	0	0	0	0
415	Ft Bragg	2	0	1	24	0	0	0	21	0	0	7	0	0	0	0	11	0	2	0	0	0
416	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
417	Ft Bragg	2	2	79	4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
418	Ft Bragg	2	0	42	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
420	Ft Bragg	2	0	45	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
421	Ft Bragg	2	2	37	8	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0
422	Ft Bragg	2	0	25	59	0	0	0	0	0	0	24	4	4	7	0	0	0	0	0	0	0
423	Ft Bragg	2	0	0	0	0	0	0	90	0	0	45	0	6	0	0	80	0	0	0	0	0
424	Ft Bragg	2	0	2	0	0	0	0	7	0	0	0	0	0	0	1	0	0	0	0	13	0
425	Ft Bragg	2	0	6	3	0	0	0	0	0	0	4	0	0	0	0	0	37	0	15	10	0
426	Ft Bragg	2	1	0	0	0	0	0	0	0	0	199	0	5	16	0	0	0	0	0	7	0
427	Ft Bragg	2	0	2	0	0	0	0	65	0	0	0	15	0	54	0	0	36	0	5	12	0
428	Ft Bragg	2	1	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
429	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
430	Ft Bragg	2	1	46	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	10
432	Ft Bragg	2	1	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
433	Ft Bragg	2	1	0	19	0	0	0	0	0	0	56	63	2	6	0	0	54	4	12	1	0
434	Ft Bragg	2	0	0	22	0	0	0	55	0	0	0	46	5	2	18	0	0	21	0	10	0
435	Ft Bragg	2	0	0	8	0	0	0	6	0	0	6	38	0	0	0	0	10	0	0	0	0
436	Ft Bragg	2	0	0	16	0	0	0	10	0	0	6	35	5	3	8	0	12	0	0	0	0
437	Ft Bragg	2	0	6	0	0	0	0	10	0	0	0	0	0	7	0	6	0	0	0	8	0
438	Ft Bragg	2	0	0	0	0	0	0	0	0	0	14	8	6	19	0	0	0	0	0	0	0
439	Ft Bragg	2	0	0	0	0	0	0	0	0	9	0	7	10	3	10	0	22	25	0	31	0
440	Ft Bragg	2	0	0	0	0	0	0	0	3	0	4	0	11	13	7	0	0	0	0	17	0
441	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	1	7	0	0	0	0	0	15	0
442	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
443	Ft Bragg	2	0	0	0	0	0	0	52	0	0	0	0	0	0	0	26	0	30	0	0	57
444	Ft Bragg	2	1	4	0	0	0	0	70	0	0	0	0	0	3	0	19	0	0	0	0	0
446	Ft Bragg	2	0	0	42	0	0	0	15	0	0	0	0	13	50	0	71	0	73	56	18	0
447	Ft Bragg	2	1	19	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	8
448	Ft Bragg	2	5	23	0	0	0	1311	0	0	0	0	0	0	0	0	10	0	0	0	0	0
449	Ft Bragg	2	0	0	0	0	0	0	54	0	0	0	12	12	10	4	22	0	25	0	4	0
450	Ft Bragg	2	2	0	29	0	0	0	43	0	0	0	0	0	0	0	0	36	0	0	0	0
451	Ft Bragg	2	0	1	9	0	0	0	53	1	0	2	3	8	1	0	7	0	0	0	29	0
452	Ft Bragg	2	1	31	0	0	0	0	0	0	0	19	10	6	2	0	0	0	5	0	0	0
454	Ft Bragg	2	4	89	0	0	0	0	0	0	0	0	5	0	2	0	0	0	0	0	19	0
456	Ft Bragg	2	3	84	16	0	0	0	0	0	1	0	3	2	0	1	0	0	0	0	10	0
458	Caspar	4	11	53	0	0	0	0	5	0	0	1	0	2	10	3	0	0	0	0	3	7
460	Caspar	4	1	18	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
462	Ft Bragg	2	9	50	0	0	0	0	0	1	0	0	0	2	4	0	0	0	0	0	0	0
464	Ft Bragg	2	0	30	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	7
466	Ft Bragg	2	11	105	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	2	0	0
468	Ft Bragg	2	13	33	0	0	0	0	0	0	0	0	0	2	11	0	0	0	0	0	0	0
469	Ft Bragg	2	0	3	0	0	0	0	0	0	0	1	4	0	7	15	0	0	19	6	0	0
470	Ft Bragg	2	12	126	125	0	0	0	0	0	0	9	1	2	7	6	2	1	0	0	15	0

TAZ	City	ATYPE	SEAS_ONLY	SF_DU	MF_DU	K8_STUD	HS_STUD	AD_STUD	HOTEL_RMS	IN JOB UNITS												
										AG_General	AG_WINERY	COM_High	COM_Medium	COM_Low	OFFICE	MEDICAL	ENT_HIGH	ENT_LOW	RESTAURAN	IND_Heavy	IND_Light	GOV_PUBLIC
472	Ft Bragg	2	3	104	0	0	0	0	0	0	0	0	0	5	1	0	3	3	0	0	4	0
474	Ft Bragg	2	31	453	169	0	0	0	62	1	0	0	13	5	9	0	13	0	1	145	90	0
475	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
476	Ft Bragg	2	36	151	53	51	13	0	98	0	7	3	0	0	5	1	31	0	0	50	42	0
477	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
478	Caspar	4	5	74	0	0	0	0	9	0	0	0	1	0	2	0	3	0	0	0	0	0
479	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
480	Ft Bragg	2	0	34	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
481	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
482	Ft Bragg	2	1	92	5	0	0	0	0	0	0	0	4	3	4	4	0	0	0	0	1	0
483	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
484	Ft Bragg	2	1	47	4	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	12	0
485	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
486	Ft Bragg	2	0	32	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	0
487	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
488	Ft Bragg	2	0	29	4	0	0	0	54	0	0	0	8	3	11	3	15	0	0	0	2	0
489	Ft Bragg	2	23	4	70	0	0	0	0	0	0	3	4	12	3	0	0	34	125	1	7	
490	Ft Bragg	2	4	27	214	0	0	0	17	0	0	0	0	1	8	0	0	0	0	0	0	0
491	Ft Bragg	2	0	80	32	0	0	0	0	0	0	11	0	3	4	0	0	0	0	1	0	0
492	Ft Bragg	2	5	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
493	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
494	Ft Bragg	2	3	23	0	0	0	0	0	0	0	0	3	1	0	1	0	0	0	0	0	0
495	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
496	Ft Bragg	2	1	23	14	0	0	0	0	0	0	54	0	0	0	0	0	0	8	11	0	0
497	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
498	Ft Bragg	2	4	49	12	0	0	0	0	0	0	5	0	2	4	0	26	33	0	6	16	0
499	Ft Bragg	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	Ft Bragg	2	0	1	5	0	0	0	39	0	0	0	46	16	26	16	5	0	22	0	16	0
501	Ft Bragg	2	3	55	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
502	Ft Bragg	2	1	15	26	0	0	0	0	0	0	3	0	1	0	0	0	0	0	8	0	0
503	Ft Bragg	2	2	47	44	0	0	0	0	0	0	2	0	56	23	40	0	0	0	33	16	0
504	Ft Bragg	2	0	16	4	0	0	0	10	0	0	0	0	3	1	0	0	0	0	0	0	0
505	Ft Bragg	2	4	51	34	0	0	0	0	0	0	0	1	4	6	2	0	0	0	18	2	0
506	Ft Bragg	2	0	36	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
507	Ft Bragg	2	1	57	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
508	Ft Bragg	2	1	14	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
509	Ft Bragg	2	1	28	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
510	Ft Bragg	2	0	23	22	0	0	0	0	0	5	13	0	2	1	0	0	0	0	10	0	0
511	Ft Bragg	2	0	38	4	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0
512	Ft Bragg	2	2	10	14	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
513	Ft Bragg	2	0	84	6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
514	Ft Bragg	2	1	42	10	0	0	0	0	0	0	0	2	0	0	0	0	0	0	10	0	0
515	Ft Bragg	2	1	22	6	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
516	Ft Bragg	2	0	69	27	449	0	0	0	0	0	0	0	6	0	15	0	0	0	0	0	9
517	Ft Bragg	2	1	65	35	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0
518	Ft Bragg	2	0	39	24	0	0	0	0	0	0	0	0	5	6	0	0	0	0	2	0	0
519	Ft Bragg	2	1	58	23	0	0	0	0	0	0	0	2	4	0	0	0	0	1	0	0	0
520	Ft Bragg	2	0	43	74	0	0	0	0	0	0	27	19	24	0	3	0	18	0	36	5	0
521	Ft Bragg	2	0	11	40	0	0	0	0	0	12	16	4	19	4	0	0	2	0	10	3	0
522	Ft Bragg	2	0	12	38	0	0	0	0	0	6	8	24	36	17	4	0	0	1	8	0	0
523	Ft Bragg	2	0	31	10	0	0	0	0	0	0	0	0	4	0	5	5	0	0	0	0	0
524	Ft Bragg	2	1	19	22	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0
525	Ft Bragg	2	0	12	5	0	0	0	0	0	0	0	0	7	0	0	0	0	0	3	0	0
526	Ft Bragg	2	1	13	6	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
527	Ft Bragg	2	0	16	12	0	0	0	0	0	0	0	1	15	0	0	0	3	0	10	0	0
528	Ft Bragg	2	0	29	38	0	0	0	0	0	4	0	0	0	1	0	0	0	0	3	0	0
529	Ft Bragg	2	1	24	25	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0
530	Ft Bragg	2	0	34	8	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
531	Ft Bragg	2	1	29	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
532	Ft Bragg	2	0	0	52	0	0	0	0	0	0	5	13	138	463	20	0	0	0	0	0	66
533	Ft Bragg	2	15	267	36	0	0	0	0	0	8	7	6	2	0	0	0	1	0	17	2	0
534	Caspar	4	8	87	0	0	0	0	4	0	0	0	1	2	0	5	0	0	3	33	0	0
535	Ft Bragg	2	0	47	25	0	0	0	0	0	0	0	0	0	0	0	0	0	6	14	28	0
536	Ft Bragg	2	28	732	0	0	0	0	0	3	0	0	2	17	48	20	8	5	0	22	0	0
538	Ft Bragg	2	0	87	7	449	618	0	0	0	0	0	0	16	38	114	16	0	1	14	10	0
540	Mendocino	4	14	53	8	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
542	Caspar	4	1	13	0	0	0	0	0	0	0	0	0	2	0	0	0	0	5	0	0	0
544	Caspar	4	12	58	0	0	0	0	0	0	0	0	0	3	0	2	0	10	3	0	2	0
546	Mendocino	4	22	176	0	0	0	0	16	0	0	9	13	37	69	9	17	2	0	3	69	0
548	Mendocino	4	4	62	0	0	0	0	0	0	0	0	0	2	17	0	0	0	0	4	7	0
550	Mendocino	4	8	49	5	275	0	0	0	0	0	0	0	4	28	6	9	0	0	0	8	0





Base Year Land Use Data

TAZ	City	ATYPE	SEAS_ONLY	SF_DU	MF_DU	K8_STUD	HS_STUD	AD_STUD	HOTEL_RMS	IN JOB UNITS												
										AG_General	AG_WINERY	COM_High	COM_Medium	COM_Low	OFFICE	MEDICAL	ENT_HIGH	ENT_LOW	RESTAURAN	IND_Heavy	IND_Light	GOV_PUBLIC
864	Ukiah	5	0	28	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
866	Potter V	3	4	44	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	2	0
868	Willits	3	9	27	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
890	Potter V	3	22	548	0	155	119	0	0	282	1	8	3	7	15	32	1	0	10	3	15	1
892	Potter V	3	17	242	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	20	1	0
894	Potter V	3	2	56	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	4	0
896	Laytonvil	1	0	31	16	0	0	0	6	2	0	0	47	8	17	52	1	0	5	9	7	2
898	Laytonvil	1	0	4	0	218	0	0	0	0	0	6	14	2	4	4	1	0	12	0	0	7
899	Laytonvil	1	2	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
900	Westport	1	11	92	0	3	0	0	6	0	0	4	0	0	0	0	0	0	0	0	0	0
902	Leggett	1	64	284	0	20	0	0	0	14	0	0	0	39	0	0	2	0	0	0	5	0
904	Willits	3	10	217	0	0	0	0	15	3	0	0	0	2	1	0	2	0	0	0	19	0
906	Piercy	1	4	48	0	0	0	0	0	0	0	2	2	5	0	0	1	0	0	0	8	0
908	Westport	1	20	88	0	0	0	0	12	0	0	0	0	0	1	0	0	0	0	0	0	0
910	Laytonvil	1	13	61	0	70	42	0	27	12	0	0	0	0	0	0	6	0	0	0	0	11
912	Laytonvil	1	7	165	0	0	0	0	28	0	0	40	11	13	0	0	5	0	0	0	19	0
914	Branscomb	1	5	62	0	10	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0
916	Laytonvil	1	23	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
918	Laytonvil	1	1	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
920	Laytonvil	1	5	81	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
922	Laytonvil	1	12	83	0	0	148	0	0	0	0	0	0	2	0	0	0	0	0	0	24	0
924	Laytonvil	1	11	244	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	1	0
926	Laytonvil	1	0	77	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
928	Laytonvil	1	2	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
930	Branscomb	1	4	88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
932	Willits	3	67	1594	0	50	0	0	20	3	0	1	5	11	20	4	4	0	0	3	30	0
934	Westport	1	4	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
936	Westport	1	23	51	0	0	0	0	7	0	0	0	3	0	0	0	0	0	1	0	0	0
938	Ft Bragg	2	4	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
940	Leggett	1	52	219	0	0	0	0	6	0	0	5	2	2	2	0	21	0	0	0	0	0
942	Covelo	1	84	947	0	335	128	0	17	17	7	30	16	6	41	65	5	0	6	10	12	121

# **Appendix C**

## **Trip Generation Rates**

**Mendocino Council of Governments (MCOG)  
Travel Demand Forecasting Model**

**October 2010**

**WC09-2631**







<b>IX/XI Percentages</b>								
<b>Productions</b>								
<b>HBW</b>	3%	1%	3%	1%	8%	10%	3%	
<b>HBO</b>	2%	2%	2%	2%	2%	3%	2%	
<b>NHB</b>	3%	2%	3%	2%	4%	3%	2%	
<b>HBSK</b>	1%	1%	1%	1%	1%	1%	1%	
<b>SP5</b>	0%	0%	0%	0%	0%	0%	0%	
<b>SP4</b>	0%	0%	0%	0%	0%	0%	0%	
<b>SP3</b>	0%	0%	0%	0%	0%	0%	0%	
<b>SP2</b>	0%	0%	0%	0%	0%	0%	0%	
<b>SP1</b>	0%	0%	0%	0%	0%	0%	0%	
<b>Attractions</b>								
<b>HBW</b>	3%	1%	3%	1%	8%	10%	3%	
<b>HBO</b>	2%	2%	2%	2%	2%	3%	2%	
<b>NHB</b>	3%	1%	3%	1%	4%	3%	2%	
<b>HBSK</b>	1%	1%	1%	1%	1%	1%	1%	
<b>SP5</b>	0%	0%	0%	0%	0%	0%	0%	
<b>SP4</b>	0%	0%	0%	0%	0%	0%	0%	
<b>SP3</b>	0%	0%	0%	0%	0%	0%	0%	
<b>SP2</b>	0%	0%	0%	0%	0%	0%	0%	
<b>SP1</b>	0%	0%	0%	0%	0%	0%	0%	

# **Appendix D**

## **Base Year Validation Results**

### **Mendocino Council of Governments (MCOG) Travel Demand Forecasting Model**

**October 2010**

**WC09-2631**

Roadway	Segment	Direction	Inbound or Westbound						Outbound or Eastbound										
			AB	Model	Traffic	Model	Maximum	Within	Model	Difference	Model	Traffic	Model	Maximum	Within	Model	Difference		
			Volume	Count	/Count	Deviation	Deviation	- Count	Squared	Volume	Count	/Count	Deviation	Deviation	- Count	Squared			
<b>Screenline 1: Ukiah Gateways</b>																			
US 101 Southbound	Between Talmage Road/SR 222 and S. State Street	Out	0	0	#DIV/0!	#N/A	#DIV/0!	0	0	9,585	8,717	1.10	0.41	Yes	868	753,424			
US 101 Northbound	Between Talmage Road/SR 222 and S. State Street	In	9,126	8,831	1.03	0.38	Yes	295	87,025	0	0	#DIV/0!	#N/A	#DIV/0!	0	0			
South State Street	between Goblet Lane and Whitmore Lane	Out	1,842	4,231	0.44	0.52	No	-2,389	5,707,321	1,394	3,705	0.38	0.58	No	-2,311	5,340,721			
S.R.222	between US 101 and Ruddick-Cunningham Road	Out	4,017	3,987	1.01	0.52	Yes	30	900	3,988	3,916	1.02	0.52	Yes	72	5,184			
Vichy Springs Road	east of Watson Road	Out	3,147	2,364	1.33	0.63	Yes	783	613,089	3,177	2,380	1.33	0.63	Yes	797	635,209			
Low Gap Road	between Bush Street and Despina Drive	In	1,997	2,511	0.80	0.58	Yes	-514	264,196	2,160	2,486	0.87	0.63	Yes	-326	106,276			
SR 20	east of U.S. 101	Out	9,445	5,932	1.59	0.48	No	3,513	12,341,169	7,312	5,960	1.23	0.48	Yes	1,352	1,827,904			
US 101 Northbound	between SR 20 and West Road	Out	0	0	#DIV/0!	#N/A	#DIV/0!	0	0	11,248	9,995	1.13	0.38	Yes	1,253	1,570,009			
US 101 Southbound	between SR 20 and West Road	In	10,954	10,638	1.03	0.36	Yes	316	99,856	0	0	#DIV/0!	#N/A	#DIV/0!	0	0			
<b>Screenline</b>			40,528	38,494	1.05	0.37	Yes	2,034	4,137,156	38,864	37,159	1.05	0.38	Yes	1,705	2,907,025			
<b>Percent RMSE =</b>			30%	< 40%						23%	< 40%								
<b>Screenline 2: Ukiah Downtown</b>																			
North State Street	between Ford Road and Gibson Street	In	9,339	9,510	0.98	0.38	Yes	-171	29,241	9,642	8,925	1.08	0.38	Yes	717	514,089			
Perkins Street	between Warren and Orchard	Out	6,892	6,371	1.08	0.44	Yes	521	271,441	6,419	6,211	1.03	0.48	Yes	208	43,264			
South State Street	between Gobbi Street and Luce Avenue	Out	8,572	8,902	0.96	0.38	Yes	-330	108,900	7,773	8,354	0.93	0.41	Yes	-581	337,561			
Gobbi Street	between Leslie Street and Orchard Avenue	In	3,392	5,574	0.61	0.48	Yes	-2,182	4,761,124	4,448	6,207	0.72	0.48	Yes	-1,759	3,094,081			
<b>Screenline</b>			28,195	30,357	0.93	0.40	Yes	-2,162	4,674,244	28,282	29,697	0.95	0.41	Yes	-1,415	2,002,225			
<b>Percent RMSE =</b>			15%	< 40%						13%	< 40%								
<b>Screenline 3: Willits Gateways</b>																			
US 101	at northern City Limit	Out	4,106	3,836	1.07	0.52	Yes	270	72,900	4,106	3,162	1.30	0.58	Yes	944	891,136			
US 101	south of Muir Mill Road	In	7,423	7,845	0.95	0.41	Yes	-422	178,084	7,427	7,816	0.95	0.41	Yes	-389	151,321			
SR 20	between Fort Bragg and Willits	In	775	937	0.83	0.68	Yes	-162	26,244	771	954	0.81	0.68	Yes	-183	33,489			
Sherwood Road	approx. 1/2 mile NW/o N. Main Street/US 101	Out	4,909	3,910	1.26	0.52	Yes	999	998,001	4,909	3,920	1.25	0.52	Yes	989	978,121			
East Hill Road	between Center Valley Road and East Side Road	Out	891	842	1.06	0.68	Yes	49	2,401	894	846	1.06	0.68	Yes	48	2,304			
Hearst Road	between Bray Road and Valley Road	Out	1,317	1,372	0.96	0.63	Yes	-55	3,025	1,314	1,357	0.97	0.63	Yes	-43	1,849			
<b>Screenline</b>			19,421	18,742	1.04	0.48	Yes	679	461,041	19,421	18,055	1.08	0.48	Yes	1,366	1,865,956			
<b>Percent RMSE =</b>			15%	< 40%						19%	< 40%								
<b>Screenline 4: Fort Bragg Gateways</b>																			
Highway 1	north of Airport Road	Out	4,599	5,185	0.89	0.48	Yes	-586	343,396	4,599	5,185	0.89	0.48	Yes	-586	343,396			
Oak Street	between Sanderson Way and Hocker Lane	Out	1,975	1,897	1.04	0.63	Yes	78	6,084	1,975	1,938	1.02	0.63	Yes	37	1,369			
SR 20	east of Summer Lane	Out	993	1,474	0.67	0.63	Yes	-481	231,361	995	1,443	0.69	0.63	Yes	-448	200,704			
Highway 1	south of SR 20	In	7,614	10,930	0.70	0.36	Yes	-3,316	10,995,856	7,614	10,930	0.70	0.36	Yes	-3,316	10,995,856			
<b>Screenline</b>			15,181	19,486	0.78	0.47	Yes	-4,305	18,533,025	15,183	19,496	0.78	0.47	Yes	-4,313	18,601,969			
<b>Percent RMSE =</b>			35%	< 40%						35%	< 40%								
<b>Screenline 5: Fort Bragg E/W</b>																			
East Cedar Street	between Morrow St and Lincoln St	EB	586	539	1.09	0.68	Yes	47	2,209	945	549	1.72	0.68	No	396	156,816			
Chestnut Street	between Harrison Street and Whipple Street	EB	1,726	2,357	0.73	0.63	Yes	-631	398,161	1,780	2,403	0.74	0.63	Yes	-623	388,129			
East Laurel Street	between Harrison Street and Whipple Street	EB	167	260	0.64	0.68	Yes	-93	8,649	203	250	0.81	0.68	Yes	-47	2,209			
Oak Street	between Sanderson Way and Hocker Lane	EB	1,975	1,897	1.04	0.63	Yes	78	6,084	1,975	1,938	1.02	0.63	Yes	37	1,369			
<b>Screenline</b>			4,454	5,053	0.88	0.61	Yes	-599	358,801	4,903	5,140	0.95	0.61	Yes	-237	56,169			
<b>Percent RMSE =</b>			26%	< 40%						29%	< 40%								
<b>Screenline 6: Coast to Valley</b>																			
SH 128	at Flynn Creek Road	EB	2,041	1,981	1.03	0.63	Yes	60	3,600	2,029	1,983	1.02	0.63	Yes	46	2,116			
SR 20	between Fort Bragg and Willits	EB	771	954	0.81	0.68	Yes	-183	33,489	775	937	0.83	0.68	Yes	-162	26,244			
Highway 1	west of Leggett	EB	174	345	0.50	0.68	Yes	-171	29,241	174	343	0.51	0.68	Yes	-169	28,561			
Oak Street	between Sanderson Way and Hocker Lane	EB	1,975	1,897	1.04	0.63	Yes	78	6,084	1,975	1,938	1.02	0.63	Yes	37	1,369			
Branscomb Road (MP19.72)	west of Laytonville	EB	331	499	0.66	0.68	Yes	-168	28,224	331	486	0.68	0.68	Yes	-155	24,025			
<b>Screenline</b>			5,292	5,676	0.93	0.61	Yes	-384	147,456	5,284	5,687	0.93	0.61	Yes	-403	162,409			
<b>Percent RMSE =</b>			12%	< 40%						11%	< 40%								
<b>Screenline 7: Model Gateways</b>																			
US 101	Humboldt County Line	Out	1,751	2,220	0.79	0.63	Yes	-469	219,961	1,751	2,261	0.77	0.63	Yes	-510	260,100			
SH 1	Sonoma County Line	In	1,506	1,369	1.10	0.63	Yes	137	18,769	1,506	1,334	1.13	0.63	Yes	172	29,584			
SH 128 / US 101 Combined	Sonoma County Line	Out	6,786	6,632	1.02	0.44	Yes	154	23,716	6,786	6,783	1.00	0.44	Yes	3	9			
SH 175	Lake County Line	Out	669	637	1.05	0.68	Yes	32	1,024	669	671	1.00	0.68	Yes	-2	4			
SH 20	Lake County Line	Out	4,625	4,174	1.11	0.52	Yes	451	203,401	4,625	4,173	1.11	0.52	Yes	452	204,304			
<b>Screenline</b>			15,337	15,032	1.02	0.51	Yes	305	93,025	15,337	15,222	1.01	0.51	Yes	115	13,225			
<b>Percent RMSE =</b>			10%	< 40%						10%	< 40%								
<b>Percent Within Caltrans Maximum Deviation = 100% =100</b>																			
<b>Percent Within Caltrans Maximum Deviation = 100% =100</b>																			
<b>Total Count</b>									7	<b>Total Count</b>									7
<b>Screenlines Within Deviation</b>									7	<b>Screenlines Within Deviation</b>									7
<b>Screenlines Outside Deviation</b>									0	<b>Screenlines Outside Deviation</b>									0

MCOG TDF Model Validation Results: Daily Two-Way Total Traffic Volumes								
STRNAME	Segment	Model Volume	Traffic Count	Model / Count	Maximum Deviation	Within Deviation	Model - Count	Difference Squared
ALBION RIDGE ROAD	between Hwy 1 and Albion River-South Side Road	2,155	2,770	0.78	0.58	Yes	-615	378,225
SH 1	north of Comptche-Ukiah Road	9,226	8,820	1.05	0.38	Yes	406	164,836
MAIN STREET	between Highway 1 and Evergreen Road	4,844	4,462	1.09	0.52	Yes	382	145,924
SIMPSON LANE	east of Highway 1	3,348	2,661	1.26	0.58	Yes	687	471,969
SOUTH STREET	between Highway 1 and Franklin Street	1,678	2,098	0.80	0.63	Yes	-420	176,400
OCEAN VIEW DRIVE	west of Harbor Avenue	2,435	2,008	1.21	0.63	Yes	427	182,329
SH 1	north of Ocean View Drive	15,229	21,860	0.70	0.27	No	-6,631	43,970,161
CHESTNUT STREET	between Harrison Street and Harold Street	3,507	4,760	0.74	0.52	Yes	-1,253	1,570,009
SH 20	east of Summer Lane	1,988	2,917	0.68	0.58	Yes	-929	863,041
EAST OAK STREET	Sanderson Way and Hocker Lane	3,950	3,835	1.03	0.52	Yes	115	13,225
SH 1	north of Pudding Creek Road	9,199	10,370	0.89	0.36	Yes	-1,171	1,371,241
SH 1	north of Little Valley Road	2,322	3,140	0.74	0.58	Yes	-818	669,124
US 101	at Mendocino/Humboldt County Line	3,501	4,481	0.78	0.52	Yes	-980	960,400
SH 1	South of Old State Highway	3,012	2,703	1.11	0.58	Yes	309	95,481
SH 253	between Stipp Lane and Robinson Creek Road	2,894	3,263	0.89	0.58	Yes	-369	136,161
US 101	between SR 20 and West Road	10,954	10,638	1.03	0.36	Yes	316	99,856
US 101	between SR 20 and West Road	11,248	9,995	1.13	0.38	Yes	1,253	1,570,009
LAKE MENDOCINO DRIVE	west of North State Street	12,460	9,807	1.27	0.38	Yes	2,653	7,038,409
SH 1	between Eureka Hill Road and Scott Lane (Point Arena)	3,758	3,530	1.06	0.58	Yes	228	51,984
SH 128	at Flynn Creek Road	4,070	3,954	1.03	0.52	Yes	116	13,456
WEST ROAD	north of US 101	5,568	5,018	1.11	0.48	Yes	550	302,500
EAST ROAD	north of School Way	2,950	3,886	0.76	0.52	Yes	-936	876,096
STATE STREET	between Ford Road and Gibson Lane	18,981	18,435	1.03	0.29	Yes	546	298,116
NORTH STATE STREET	south of Orr Springs Road	11,094	15,965	0.69	0.30	No	-4,871	23,726,641
HENSLEY CREEK ROAD	west of North State Street	5,034	4,004	1.26	0.52	Yes	1,030	1,060,900
ORR SPRINGS ROAD	west of North State Street	3,375	3,036	1.11	0.58	Yes	339	114,921
WEST ROAD	south of School Way	8,629	8,729	0.99	0.41	Yes	-100	10,000
US 101	north of Branscomb Road, Laytonville	5,588	6,275	0.89	0.44	Yes	-687	471,969
US 101	north of Ramsey Road	7,165	8,099	0.88	0.41	Yes	-934	872,356
BRANSCOMB ROAD	east of Willis Avenue	2,017	4,175	0.48	0.52	Yes	-2,158	4,656,964
US 101	at northern City Limit	8,212	6,998	1.17	0.44	Yes	1,214	1,473,796
US 101	south of Muir Mill Road	14,850	15,661	0.95	0.30	Yes	-811	657,721
SHERWOOD ROAD	approx. 1/2 mile NW/o N. Main Street/US 101	9,817	7,830	1.25	0.41	Yes	1,987	3,948,169
BLOSSER LANE	north of Robert Drive	1,219	2,862	0.43	0.58	Yes	-1,643	2,699,449
BAECHTEL ROAD	east of S. Main Street/US 101	2,188	3,142	0.70	0.58	Yes	-954	910,116
HOLLY STREET	west of S. Main Street/US 101	815	3,712	0.22	0.58	No	-2,897	8,392,609
US 101	north of E San Francisco Avenue	18,852	21,203	0.89	0.28	Yes	-2,351	5,527,201
EAST COMMERCIAL STREET	between Humboldt Street and Lenore Avenue	2,000	5,031	0.40	0.48	No	-3,031	9,186,961
WEST COMMERCIAL STREET	between N. Main Street/US 101 and Mill Creek Drive	2,134	2,106	1.01	0.63	Yes	28	784
US 101	north of Willits at Shimmings Ridge Road	7,077	6,975	1.01	0.44	Yes	102	10,404
US 101	on Longvale Grade	13,442	15,046	0.89	0.30	Yes	-1,604	2,572,816
US 101	Between Talmage Road/SR 222 and S. State Street	9,585	8,717	1.10	0.41	Yes	868	753,424
US 101	Between Talmage Road/SR 222 and S. State Street	9,126	8,831	1.03	0.38	Yes	295	87,025
SOUTH STATE STREET	between Jefferson Land and Laws Avenue	8,662	10,293	0.84	0.36	Yes	-1,631	2,660,161
SH 253	west of South State Street	3,720	2,523	1.47	0.58	Yes	1,197	1,432,809
SOUTH STATE STREET	between Gobalet Lane and Whitmore Lane	3,235	7,936	0.41	0.41	No	-4,701	22,099,401
NORTH STATE STREET	south of West Road	2,773	3,192	0.87	0.58	Yes	-419	175,561
VICHY SPRINGS ROAD	between Redemeyer Road and Watson Road	4,380	3,282	1.33	0.58	Yes	1,098	1,205,604
SH 222	between US 101 and Ruddick-Cunningham Road	8,004	7,903	1.01	0.41	Yes	101	10,201
TALMAGE ROAD	between Airport Park Blvd and Betty Street	9,905	15,824	0.63	0.30	No	-5,919	35,034,561
SOUTH STATE STREET	between Freitas Avenue and Cherry Street	16,344	17,256	0.95	0.29	Yes	-912	831,744
PERKINS STREET	west of Orchard Avenue	13,311	12,582	1.06	0.33	Yes	729	531,441
GOBBI STREET	between Leslie Street and Orchard Avenue	7,840	11,781	0.67	0.34	Yes	-3,941	15,531,481
VICHY SPRINGS ROAD	east of Watson Road	6,324	4,744	1.33	0.52	Yes	1,580	2,496,400
REDEMEYER ROAD	north of El Dorado Road	3,429	2,552	1.34	0.58	Yes	877	769,129
EAST ROAD	north of Road A	2,995	4,164	0.72	0.52	Yes	-1,169	1,366,561
EAST SIDE POTTER VALLEY ROAD	north of SR 20	5,752	3,112	1.85	0.58	No	2,640	6,969,600
LAKE MENDOCINO DRIVE	east of North State Street	5,987	4,911	1.22	0.52	Yes	1,076	1,157,776
EAST SIDE CALPELLA ROAD	between Moore Street and SR 20	2,589	2,557	1.01	0.58	Yes	32	1,024
SH 20	east of U.S. 101	16,756	11,892	1.41	0.34	No	4,864	23,658,496
EAST ROAD	south of School Way	2,663	5,430	0.49	0.48	No	-2,767	7,656,289
SH 20	at Mendocino/Lake County Line	9,249	8,347	1.11	0.41	Yes	902	813,604
US 101 / SH 128	at Sonoma County Line	13,572	13,415	1.01	0.33	Yes	157	24,649
SCHOOL WAY	east of West Road	2,984	4,610	0.65	0.52	Yes	-1,626	2,643,876
HEARST WILLITS ROAD	east of Bray Road	2,631	2,729	0.96	0.58	Yes	-98	9,604
NORTH STATE STREET	south of Angels Lane	3,228	6,168	0.52	0.48	No	-2,940	8,643,600
DELLA AVENUE	between Locust Street and Meadowbrook Drive	833	2,273	0.37	0.63	No	-1,440	2,073,600
DORA STREET	north of Jones Street	1,266	7,708	0.16	0.41	No	-6,442	41,499,364
BRANSCOMB ROAD	east of Bauer Road	2,534	3,869	0.65	0.52	Yes	-1,335	1,782,225
LOW GAP ROAD	west of Bush Street	4,156	4,997	0.83	0.52	Yes	-841	707,281
STATE STREET	between Clay Street and Mill Street	10,984	13,923	0.79	0.31	Yes	-2,939	8,637,721
NORTH FRANKLIN STREET	south of East Laurel Street	3,238	3,961	0.82	0.52	Yes	-723	522,729
NORTH STATE STREET	north of Hensley Creek Road	11,016	14,203	0.78	0.31	Yes	-3,187	10,156,969
NORTH STATE STREET	north of Lake Mendocino Drive	7,100	9,445	0.75	0.38	Yes	-2,345	5,499,025
SH 1	north of Navarro Ridge Road	4,414	4,930	0.90	0.52	Yes	-516	266,256

MCOG TDF Model Validation Results: AM Peak Hour Two-Way Total Traffic Volumes								
STRNAME	Segment	Model Volume	Traffic Count	Model / Count	Maximum Deviation	Within Deviation	Model - Count	Difference Squared
SH 1	north of Comptche-Ukiah Road	566	706	0.80	0.44	Yes	-140	19,600
MAIN STREET	between Highway 1 and Evergreen Road	270	303	0.89	0.58	Yes	-33	1,089
SH 1	north of Ocean View Drive	1,045	1,749	0.60	0.29	No	-704	495,616
CHESTNUT STREET	between Harrison Street and Harold Street	283	632	0.45	0.44	Yes	-349	121,801
EAST OAK STREET	Sanderson Way and Hocker Lane	380	446	0.85	0.52	Yes	-66	4,356
SH 1	north of Pudding Creek Road	615	830	0.74	0.41	Yes	-215	46,225
SH 1	north of Little Valley Road	143	251	0.57	0.58	Yes	-108	11,664
US 101	at Mendocino/Humboldt County Line	193	200	0.97	0.63	Yes	-7	49
SH 253	between Slipp Lane and Robinson Creek Road	256	201	1.27	0.63	Yes	55	3,025
US 101	between SR 20 and West Road	1,316	794	1.66	0.41	Yes	522	272,484
US 101	between SR 20 and West Road	379	477	0.79	0.52	Yes	-98	9,604
LAKE MENDOCINO DRIVE	west of North State Street	997	689	1.45	0.44	Yes	308	94,864
SH 1	between Eureka Hill Road and Scott Lane (Point Arena)	254	282	0.90	0.58	Yes	-28	784
SH 128	at Flynn Creek Road	284	239	1.19	0.63	Yes	45	2,025
WEST ROAD	north of US 101	380	520	0.73	0.48	Yes	-140	19,600
EAST ROAD	north of School Way	202	223	0.91	0.63	Yes	-21	441
STATE STREET	between Ford Road and Gibson Lane	1,235	973	1.27	0.38	Yes	262	68,644
STATE STREET	between Ford Road and Clara Avenue	1,212	988	1.23	0.38	No	224	50,176
NORTH STATE STREET	south of Ford Road	961	988	0.97	0.38	No	-27	729
NORTH STATE STREET	between Hensley Creek Road and Orr Springs Road	725	919	0.79	0.38	No	-194	37,636
NORTH STATE STREET	south of Orr Springs Road	912	992	0.92	0.38	No	-80	6,400
HENSLEY CREEK ROAD	west of North State Street	770	276	2.79	0.58	Yes	494	244,036
WEST ROAD	south of School Way	559	689	0.81	0.44	Yes	-130	16,900
US 101	north of Branscomb Road, Laytonville	365	345	1.06	0.58	Yes	20	400
US 101	north of Ramsey Road	505	474	1.07	0.52	Yes	31	961
US 101	at northern City Limit	651	380	1.71	0.52	Yes	271	73,441
US 101	south of Muir Mill Road	1,189	1,004	1.18	0.36	Yes	185	34,225
SHERWOOD ROAD	approx. 1/2 mile NW/o N. Main Street/US 101	729	629	1.16	0.44	Yes	100	10,000
BLOSSER LANE	north of Robert Drive	67	412	0.16	0.52	Yes	-345	119,025
BAECHTEL ROAD	east of S. Main Street/US 101	160	263	0.61	0.58	Yes	-103	10,609
HOLLY STREET	west of S. Main Street/US 101	44	294	0.15	0.58	No	-250	62,500
US 101	north of E San Francisco Avenue	1,323	1,546	0.86	0.30	Yes	-223	49,729
EAST COMMERCIAL STREET	between Humboldt Street and Lenore Avenue	150	345	0.43	0.58	No	-195	38,025
WEST COMMERCIAL STREET	between N. Main Street/US 101 and Mill Creek Drive	186	258	0.72	0.58	Yes	-72	5,184
US 101	north of Willits at Shimmins Ridge Road	570	337	1.69	0.58	Yes	233	54,289
US 101	on Longvale Grade	1,128	874	1.29	0.41	Yes	254	64,516
US 101	Between Talmage Road/SR 222 and S. State Street	549	504	1.09	0.48	Yes	45	2,025
US 101	Between Talmage Road/SR 222 and S. State Street	632	517	1.22	0.48	Yes	115	13,225
SOUTH STATE STREET	between Jefferson Land and Laws Avenue	609	685	0.89	0.44	Yes	-76	5,776
SOUTH STATE STREET	between Gobalet Lane and Whitmore Lane	213	393	0.54	0.52	No	-180	32,400
VICHY SPRINGS ROAD	between Redemeyer Road and Watson Road	301	255	1.18	0.58	Yes	46	2,116
SH 222	between US 101 and Ruddick-Cunningham Road	643	496	1.30	0.52	Yes	147	21,609
TALMAGE ROAD	between Airport Park Blvd and Betty Street	616	787	0.78	0.41	No	-171	29,241
SOUTH STATE STREET	between Freitas Avenue and Cherry Street	979	733	1.34	0.44	Yes	246	60,516
PERKINS STREET	west of Orchard Avenue	792	723	1.10	0.44	Yes	69	4,761
GOBBI STREET	between Leslie Street and Orchard Avenue	455	659	0.69	0.44	Yes	-204	41,616
VICHY SPRINGS ROAD	east of Watson Road	416	373	1.12	0.58	Yes	43	1,849
EAST ROAD	north of Road A	197	274	0.72	0.58	Yes	-77	5,929
LAKE MENDOCINO DRIVE	east of North State Street	409	414	0.99	0.52	Yes	-5	25
SH 20	east of U.S. 101	1,076	902	1.19	0.38	No	174	30,276
EAST ROAD	south of School Way	216	362	0.60	0.58	No	-146	21,316
SH 20	at Mendocino/Lake County Line	470	490	0.96	0.52	Yes	-20	400
US 101 / SH 128	at Sonoma County Line	697	773	0.90	0.41	Yes	-76	5,776
SCHOOL WAY	east of West Road	173	392	0.44	0.52	Yes	-219	47,961
HEARST WILLITS ROAD	east of Bray Road	188	204	0.92	0.63	Yes	-16	256
NORTH STATE STREET	south of Angels Lane	290	385	0.75	0.52	No	-95	9,025
DELLA AVENUE	between Locust Street and Meadowbrook Drive	46	239	0.19	0.63	No	-193	37,249
DORA STREET	north of Jones Street	111	610	0.18	0.48	No	-499	249,001
BRANSCOMB ROAD	east of Bauer Road	214	204	1.05	0.63	Yes	10	100
LOW GAP ROAD	west of Bush Street	355	634	0.56	0.44	Yes	-279	77,841
STATE STREET	between Clay Street and Mill Street	678	597	1.14	0.48	Yes	81	6,561
NORTH STATE STREET	north of Hensley Creek Road	1,030	810	1.27	0.41	Yes	220	48,400
NORTH STATE STREET	north of Lake Mendocino Drive	522	483	1.08	0.52	Yes	39	1,521
SH 1	north of Navarro Ridge Road	260	394	0.66	0.52	Yes	-134	17,956

PM 2 Way Validation

MCOG TDF Model Validation Results: PM Peak Hour Two-Way Total Traffic Volumes								
STRNAME	Segment	Model Volume	Traffic Count	Model / Count	Maximum Deviation	Within Deviation	Model - Count	Difference Squared
SH 1	between Cameron Road and SR 128	344	274	1.26	0.58	Yes	70	4,900
SH 1	north of Lansing Road	790	1,202	0.66	0.34	No	-412	169,744
SH 1	north of Albion Ridge Road	439	606	0.72	0.48	Yes	-167	27,889
ALBION RIDGE ROAD	between Hwy 1 and Albion River-South Side Road	211	230	0.92	0.63	Yes	-19	361
SH 1	north of Albion-Little River Road	413	552	0.75	0.48	Yes	-139	19,321
SH 1	north of Comptche-Ukiah Road	928	882	1.05	0.38	Yes	46	2,116
SH 1	north of Main Street/Jackson Road	534	876	0.61	0.38	No	-342	116,964
MAIN STREET	between Highway 1 and Evergreen Road	569	383	1.49	0.52	Yes	186	34,596
SH 1	north of Little Lake Road	757	931	0.81	0.38	Yes	-174	30,276
SH 1	north of Point Cabrillo Drive	831	1,239	0.67	0.34	Yes	-408	166,464
SH 1	north of Gibney Road	811	1,400	0.58	0.31	No	-589	346,921
SH 1	north of Odom Lane	341	671	0.51	0.44	No	-330	108,900
SIMPSON LANE	east of Highway 1	316	233	1.36	0.63	Yes	83	6,889
SH 1	north of Simpson Lane	1,156	1,979	0.58	0.28	No	-823	677,329
SH 1	north of SR 20	1,391	2,227	0.62	0.27	No	-836	698,896
SH 1	north of Ocean View Drive	1,580	2,186	0.72	0.27	No	-606	367,236
SH 1	between Cypress Street and Walnut Street	1,409	2,462	0.57	0.26	No	-1,053	1,108,809
CHESTNUT STREET	between Harrison Street and Harold Street	387	491	0.79	0.52	Yes	-104	10,816
SH 20	east of Summer Lane	147	229	0.64	0.63	Yes	-82	6,724
EAST OAK STREET	Sanderson Way and Hocker Lane	348	410	0.85	0.52	Yes	-62	3,844
SH 1	north of Pudding Creek Road	906	1,037	0.87	0.36	Yes	-131	17,161
SH 1	north of Little Valley Road	222	314	0.71	0.58	Yes	-92	8,464
US 101	at Mendocino/Humboldt County Line	279	320	0.87	0.58	Yes	-41	1,681
SH 1	South of Old State Highway	205	228	0.90	0.63	Yes	-23	529
SH 253	between Stipp Lane and Robinson Creek Road	239	231	1.03	0.63	Yes	8	64
US 101	between SR 20 and West Road	532	663	0.80	0.44	Yes	-131	17,161
US 101	between SR 20 and West Road	1,472	963	1.53	0.38	No	509	259,081
LAKE MENDOCINO DRIVE	west of North State Street	1,178	674	1.75	0.44	No	504	254,016
SH 1	north of Iverson Road	368	269	1.37	0.58	Yes	99	9,801
SH 1	between Iverson Road and Mill Street (Point Arena)	320	355	0.90	0.58	Yes	-35	1,225
SH 1	between Eureka Hill Road and Scott Lane (Point Arena)	273	353	0.77	0.58	Yes	-80	6,400
SH 1	south of Windy Hollow Road	285	341	0.84	0.58	Yes	-56	3,136
SH 1	north of Mountain View Road	273	343	0.80	0.58	Yes	-70	4,900
SH 1	north of Fish Rock Road	360	396	0.91	0.52	Yes	-36	1,296
SH 128	at Flynn Creek Road	284	304	0.93	0.58	Yes	-20	400
WEST ROAD	north of US 101	493	336	1.47	0.58	Yes	157	24,649
EAST ROAD	north of School Way	301	293	1.03	0.58	Yes	8	64
STATE STREET	between Ford Road and Gibson Lane	2,103	1,267	1.66	0.33	No	836	698,896
STATE STREET	between Ford Road and Clara Avenue	2,013	1,512	1.33	0.30	No	501	251,001
NORTH STATE STREET	south of Ford Road	1,679	1,512	1.11	0.30	Yes	167	27,889
NORTH STATE STREET	between Hensley Creek Road and Orr Springs Road	849	1,272	0.67	0.33	No	-423	178,929
NORTH STATE STREET	south of Orr Springs Road	1,224	1,312	0.93	0.33	Yes	-88	7,744
HENSLEY CREEK ROAD	west of North State Street	270	312	0.87	0.58	Yes	-42	1,764
WEST ROAD	south of School Way	825	580	1.42	0.48	Yes	245	60,025
US 101	north of Branscomb Road, Laytonville	485	644	0.75	0.44	Yes	-159	25,281
US 101	north of Ramsey Road	654	832	0.79	0.41	Yes	-178	31,684
BRANSCOMB ROAD	east of Willis Avenue	185	309	0.60	0.58	Yes	-124	15,376
US 101	at northern City Limit	739	603	1.23	0.48	Yes	136	18,496
US 101	south of Muir Mill Road	1,270	1,200	1.06	0.34	Yes	70	4,900
SHERWOOD ROAD	approx. 1/2 mile NW/o N. Main Street/US 101	923	568	1.63	0.48	No	355	126,025
BLOSSER LANE	north of Robert Drive	143	302	0.47	0.58	Yes	-159	25,281
SCHOOL STREET	between Mendocino Street and Pine Street	122	212	0.58	0.63	Yes	-90	8,100
BAECHTEL ROAD	east of S. Main Street/US 101	258	254	1.02	0.58	Yes	4	16
HOLLY STREET	west of S. Main Street/US 101	100	389	0.26	0.52	No	-289	83,521
US 101	north of E San Francisco Avenue	1,720	1,628	1.06	0.29	Yes	92	8,464
EAST COMMERCIAL STREET	between Humboldt Street and Lenore Avenue	225	384	0.59	0.52	Yes	-159	25,281
US 101	north of Willits at Shimmings Ridge Road	630	505	1.25	0.48	Yes	125	15,625
US 101	on Longvale Grade	1,178	1,200	0.98	0.34	Yes	-22	484
US 101	Between Talmage Road/SR 222 and S. State Street	827	667	1.24	0.44	Yes	160	25,600
US 101	Between Talmage Road/SR 222 and S. State Street	719	658	1.09	0.44	Yes	61	3,721
SOUTH STATE STREET	between Jefferson Land and Laws Avenue	881	868	1.01	0.41	Yes	13	169
SH 253	west of South State Street	343	218	1.57	0.63	Yes	125	15,625
SOUTH STATE STREET	between Gobalet Lane and Whitmore Lane	331	524	0.63	0.48	Yes	-193	37,249
NORTH STATE STREET	south of West Road	310	214	1.45	0.63	Yes	96	9,216
VICHY SPRINGS ROAD	between Redemeyer Road and Watson Road	436	275	1.59	0.58	No	161	25,921
SH 222	between US 101 and Ruddick-Cunningham Road	748	625	1.20	0.44	Yes	123	15,129
TALMAGE ROAD	between Airport Park Blvd and Betty Street	1,082	1,095	0.99	0.36	Yes	-13	169
SOUTH STATE STREET	between Freitas Avenue and Cherry Street	1,996	1,204	1.66	0.34	No	792	627,264
PERKINS STREET	west of Orchard Avenue	1,357	853	1.59	0.41	No	504	254,016
GOBBI STREET	between Leslie Street and Orchard Avenue	957	832	1.15	0.41	Yes	125	15,625
VICHY SPRINGS ROAD	east of Watson Road	646	412	1.57	0.52	No	234	54,756
REDEMEYER ROAD	north of El Dorado Road	338	221	1.53	0.63	Yes	117	13,689
EAST ROAD	north of Road A	337	345	0.98	0.58	Yes	-8	64
LAKE MENDOCINO DRIVE	east of North State Street	610	583	1.05	0.48	Yes	27	729
SH 20	east of U.S. 101	1,268	946	1.34	0.38	Yes	322	103,684
EAST ROAD	south of School Way	254	414	0.61	0.52	Yes	-160	25,600
SH 20	at Mendocino/Lake County Line	635	692	0.92	0.44	Yes	-57	3,249
US 101 / SH 128	at Sonoma County Line	951	1,116	0.85	0.36	Yes	-165	27,225
SCHOOL WAY	east of West Road	326	364	0.90	0.58	Yes	-38	1,444
NORTH STATE STREET	south of Angels Lane	389	454	0.86	0.52	Yes	-65	4,225
DELLA AVENUE	between Locust Street and Meadowbrook Drive	105	258	0.41	0.58	No	-153	23,409
DORA STREET	north of Jones Street	125	553	0.23	0.48	No	-428	183,184
BRANSCOMB ROAD	east of Bauer Road	239	279	0.86	0.58	Yes	-40	1,600
LOW GAP ROAD	west of Bush Street	455	391	1.16	0.52	Yes	64	4,096
STATE STREET	between Clay Street and Mill Street	1,323	984	1.34	0.38	Yes	339	114,921
NORTH FRANKLIN STREET	south of East Laurel Street	331	384	0.86	0.52	Yes	-53	2,809
NORTH STATE STREET	north of Hensley Creek Road	1,062	1,006	1.06	0.36	Yes	56	3,136
NORTH STATE STREET	north of Lake Mendocino Drive	765	783	0.98	0.41	Yes	-18	324
SH 1	north of Fern Creek Road	791	1,215	0.65	0.34	No	-424	179,776
SH 1	north of Little River-Airport Road	535	700	0.76	0.44	Yes	-165	27,225
SH 1	north of Navarro Ridge Road	363	493	0.74	0.52	Yes	-130	16,900

# **Appendix E**

## **Hourly Factors**

**Mendocino Council of Governments (MCOG)  
Travel Demand Forecasting Model**

**October 2010**

**WC09-2631**





# **Appendix F**

## **Future Year Land Use Data**

**Mendocino Council of Governments (MCOG)  
Travel Demand Forecasting Model**

**October 2010**

**WC09-2631**



















TAZ	CITY	ATYPE	SEAS_ONLY	SF_DU	MF_DU	K8_STUD	HS_STUD	AD_STUD	HOTEL_RMS	IN JOB UNITS												
										AG_GENERAL	AG_WINERY	COM_HIGH	COM_MEDIUM	COM_LOW	OFFICE	MEDICAL	ENT_HIGH	ENT_LOW	RESTAURANT	IND_HEAVY	IND_LIGHT	GOV_PUBLIC
864	Ukiah	5	0	32	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
866	Potter V	3	4	53	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0
868	Willits	3	9	32	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
890	Potter V	3	22	563	0	165	127	0	0	290	1	8	3	7	15	32	1	0	10	3	15	5
892	Potter V	3	17	251	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	20	1	0
894	Potter V	3	2	58	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	4	0
896	Laytonvil	1	0	33	18	0	0	0	6	2	0	2	49	10	18	53	1	0	6	9	7	3
898	Laytonvil	1	0	5	0	232	0	0	0	0	0	6	14	2	4	4	1	0	12	0	0	9
899	Laytonvil	1	2	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
900	Westport	1	11	96	0	3	0	0	6	0	0	4	0	1	0	0	0	0	0	0	0	0
902	Leggett	1	64	309	13	21	0	0	0	15	0	0	0	39	2	0	2	0	0	0	5	0
904	Willits	3	10	229	0	0	0	0	15	3	0	0	0	2	1	0	2	0	0	0	19	0
906	Piercy	1	4	52	0	0	0	0	0	0	0	2	5	2	0	1	0	0	0	0	8	0
908	Westport	1	20	89	0	0	0	0	12	0	0	0	1	1	2	0	0	0	0	0	0	0
910	Laytonvil	1	13	70	0	75	45	0	27	13	0	0	0	1	0	6	0	0	0	0	0	12
912	Laytonvil	1	7	170	2	0	0	0	28	0	0	43	14	15	3	1	5	0	3	0	19	0
914	Branscomb	1	5	66	0	10	0	0	0	0	0	5	0	0	0	0	3	0	0	0	0	0
916	Laytonvil	1	23	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
918	Laytonvil	1	1	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
920	Laytonvil	1	5	84	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
922	Laytonvil	1	12	89	10	0	157	0	0	12	0	0	1	3	2	0	0	0	0	0	27	0
924	Laytonvil	1	11	247	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	1	0
926	Laytonvil	1	0	80	15	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
928	Laytonvil	1	2	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
930	Branscomb	1	4	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
932	Willits	3	67	1929	30	53	0	0	20	3	0	4	7	14	32	6	4	0	0	3	30	6
934	Westport	1	4	10	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
936	Westport	1	23	54	0	0	0	0	7	0	0	5	3	0	4	1	0	0	1	0	0	0
938	Ft Bragg	2	4	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
940	Leggett	1	52	232	0	0	0	0	6	0	0	8	4	3	2	0	21	0	0	0	0	2
942	Covelo	1	84	998	5	356	136	0	17	19	7	30	16	6	41	65	5	0	6	15	27	139

TAZ	CITY	ATYPE	SEAS_ONLY	SF_DU	MF_DU	K8_STUD	HS_STUD	AD_STUD	HOTEL_RMS	IN JOB UNITS											
										AG_GENERAL	AG_WINERY	COM_HIGH	COM_MEDIUM	COM_LOW	OFFICE	MEDICAL	ENT_HIGH	ENT_LOW	RESTAURANT	IND_HEAVY	IND_LIGHT
1	Ukiah	5	0	8	0	0	0	0	69	0	0	0	0	1	0	3	0	0	0	0	31
3	Ukiah	5	0	0	0	0	0	0	0	0	0	255	27	11	0	0	0	0	42	0	0
5	Ukiah	5	0	0	0	0	0	0	0	0	0	92	38	5	6	25	0	0	13	0	5
6	Ukiah	5	0	10	8	0	0	0	0	0	0	0	58	3	18	973	0	0	0	0	25
7	Ukiah	5	0	0	0	0	0	0	0	0	0	0	1	0	48	0	0	0	0	0	5
8	Ukiah	5	0	0	0	0	0	0	0	0	0	0	5	2	6	4	0	0	0	0	23
9	Ukiah	5	0	0	0	0	0	0	0	0	0	0	8	21	18	0	0	0	0	4	40
10	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	102
11	Ukiah	5	0	0	0	0	0	0	0	2	0	0	4	10	39	2	0	0	10	3	17
12	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	20	3	0	0	0	0	0
13	Ukiah	5	0	1	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0	1
14	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	Ukiah	5	0	4	11	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
16	Ukiah	5	0	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Ukiah	5	0	13	28	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
18	Ukiah	5	0	54	9	0	0	0	0	0	0	0	0	1	2	0	0	0	0	2	8
19	Ukiah	5	0	75	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
20	Ukiah	5	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
21	Ukiah	5	0	26	5	0	0	0	0	0	0	0	0	3	0	0	0	0	0	8	0
22	Ukiah	5	0	5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
23	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	11	6	2	0	0	0	0	4
24	Ukiah	5	0	4	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0
25	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	120	0	0	0	0	0	0	12
26	Ukiah	5	0	0	8	0	0	0	0	0	1	3	10	10	6	5	0	3	0	0	0
27	Ukiah	5	0	0	10	0	0	0	0	0	0	8	1	23	4	0	0	30	0	1	0
28	Ukiah	5	0	0	0	0	0	0	0	0	0	1	1	12	0	0	0	23	0	0	0
29	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	6	6	7	0	0	0	10	89
30	Ukiah	5	0	12	90	0	0	0	0	0	0	14	13	49	2	3	0	0	0	35	8
31	Ukiah	5	0	0	10	0	0	0	0	0	1	16	11	162	25	3	0	18	2	5	74
32	Ukiah	5	0	3	0	0	0	0	0	0	0	4	0	12	10	0	0	0	0	20	12
33	Ukiah	5	0	3	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	8
34	Ukiah	5	1	4	8	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
35	Ukiah	5	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	Ukiah	5	1	31	57	0	0	0	0	0	0	2	10	10	2	0	0	0	0	0	10
37	Ukiah	5	0	32	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
38	Ukiah	5	0	55	6	0	0	0	0	0	0	0	0	8	0	0	0	0	0	2	0
39	Ukiah	5	0	39	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0
40	Ukiah	5	0	156	66	0	0	0	20	0	0	5	3	22	26	3	1	15	3	14	23
41	Ukiah	5	0	6	62	0	0	0	0	0	0	2	0	32	8	0	0	54	7	14	0
42	Ukiah	5	0	11	59	0	0	0	0	0	0	2	1	6	5	0	0	0	0	0	0
43	Ukiah	5	0	20	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
44	Ukiah	5	0	18	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	Ukiah	5	0	11	128	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
46	Ukiah	5	0	68	116	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
47	Ukiah	5	0	8	36	0	0	0	0	0	0	0	0	8	0	0	0	0	0	2	0
48	Ukiah	5	0	13	15	0	0	0	0	0	10	8	53	76	15	9	0	5	0	47	0
49	Ukiah	5	0	59	41	0	0	0	0	0	2	5	3	15	14	0	0	7	0	2	19
50	Ukiah	5	0	49	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
51	Ukiah	5	0	103	5	718	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
52	Ukiah	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	Ukiah	5	0	12	0	515	0	100	0	0	0	0	0	0	0	0	0	0	0	0	12
54	Ukiah	5	0	97	86	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0
55	Ukiah	5	0	2	0	166	63	0	0	0	3	3	38	1	7	0	0	0	0	131	2
57	Ukiah	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0
59	Ukiah	5	0	1	0	161	79	0	0	0	20	5	9	33	4	13	0	118	0	66	7
60	Ukiah	5	0	134	0	0	0	0	0	0	0	3	0	0	0	0	0	0	2	1	0
61	Ukiah	5	0	0	0	0	0	0	0	0	0	0	5	0	2	0	0	0	0	16	0
62	Ukiah	5	0	130	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
63	Ukiah	5	0	0	0	0	0	0	57	0	0	6	3	35	0	1	0	8	0	19	0
64	Ukiah	5	0	191	97	0	0	0	0	0	0	0	13	3	0	3	0	1	2	13	0
65	Ukiah	5	0	106	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	6
66	Ukiah	5	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
67	Ukiah	5	0	80	6	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4	0
68	Ukiah	5	1	90	71	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	0
69	Ukiah	5	0	14	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	Ukiah	5	0	2	0	0	0	0	175	0	0	5	0	3	23	0	17	0	65	6	18
71	Ukiah	5	0	0	0	0	0	0	0	0	165	26	0	18	3	12	0	6	0	8	0
72	Ukiah	5	0	0	89	0	0	0	0	0	11	0	0	0	2	0	0	20	3	0	0
73	Ukiah	5	0	45	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
74	Ukiah	5	0	66	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	Ukiah	5	0	0	0	0	0	0	0	0	0	22	57	3	6	8	0	82	0	7	0

















TAZ	CITY	ATYPE	SEAS_ONLY	SF_DU	MF_DU	K8_STUD	HS_STUD	AD_STUD	HOTEL_RMS	IN JOB UNITS												
										AG_GENERAL	AG_WINERY	COM_HIGH	COM_MEDIUM	COM_LOW	OFFICE	MEDICAL	ENT_HIGH	ENT_LOW	RESTAURANT	IND_HEAVY	IND_LIGHT	GOV_PUBLIC
864	Ukiah	5	0	36	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
866	Potter V	3	4	62	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0
868	Willits	3	9	36	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
890	Potter V	3	22	577	0	174	134	0	0	297	1	8	3	7	15	32	1	0	10	3	15	9
892	Potter V	3	17	260	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	20	1	0
894	Potter V	3	2	59	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	4	0
896	Laytonvil	1	0	35	20	0	0	0	6	2	0	4	50	12	18	54	1	0	6	9	7	3
898	Laytonvil	1	0	5	0	245	0	0	0	0	0	6	14	2	4	4	1	0	12	0	0	10
899	Laytonvil	1	2	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
900	Westport	1	11	100	0	3	0	0	6	0	0	4	0	2	0	0	0	0	0	0	0	0
902	Leggett	1	64	333	25	22	0	0	0	16	0	0	0	39	4	0	2	0	0	0	5	0
904	Willits	3	10	241	0	0	0	0	15	3	0	0	0	2	1	0	2	0	0	0	19	0
906	Piercy	1	4	55	0	0	0	0	0	0	0	2	2	5	3	0	1	0	0	0	8	0
908	Westport	1	20	90	0	0	0	0	12	0	0	0	2	2	3	0	0	0	0	0	0	0
910	Laytonvil	1	13	78	0	79	47	0	27	14	0	0	0	1	0	6	0	0	0	0	0	12
912	Laytonvil	1	7	175	4	0	0	0	28	0	0	45	16	17	6	2	5	0	5	0	19	0
914	Branscomb	1	5	69	0	10	0	0	0	0	0	6	0	0	0	0	3	0	0	0	0	0
916	Laytonvil	1	23	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
918	Laytonvil	1	1	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
920	Laytonvil	1	5	86	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
922	Laytonvil	1	12	95	20	0	166	0	0	12	0	0	1	3	3	0	0	0	0	0	29	0
924	Laytonvil	1	11	250	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	1	0
926	Laytonvil	1	0	82	30	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5
928	Laytonvil	1	2	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
930	Branscomb	1	4	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
932	Willits	3	67	2264	60	56	0	0	20	3	0	6	9	16	43	8	4	0	0	3	30	12
934	Westport	1	4	10	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
936	Westport	1	23	56	0	0	0	0	7	0	0	9	3	0	7	2	0	0	1	0	0	0
938	Ft Bragg	2	4	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
940	Leggett	1	52	244	0	0	0	0	6	0	0	11	5	4	2	0	21	0	0	0	0	3
942	Covelo	1	84	1049	10	377	144	0	17	21	0	7	30	16	6	41	65	5	0	6	20	42

# **Appendix G**

## **Through Trip Matrices**

**Mendocino Council of Governments (MCOG)  
Travel Demand Forecasting Model**

**October 2010**

**WC09-2631**

<b>2009 Through Trip Matrix</b>							
External Station		Highway 1	US 101	CA 128 / US 101	CA 20	CA 175	
		Sonoma County Line	Humboldt County Line	Sonoma County Line	Lake County Line	Lake County Line	Total
Highway 1	Sonoma County Line	0	116	0	0	4	120
US 101	Humboldt County Line	116	0	1,233	264	40	1,653
CA 128 / US 101	Sonoma County Line	0	1,233	0	257	39	1,529
CA 20	Lake County Line	0	264	257	0	0	521
CA 175	Lake County Line	4	40	39	0	0	83
Total		120	1,653	1,529	521	83	3,906
<b>2020 Through Trip Matrix</b>							
External Station		Highway 1	US 101	CA 128 / US 101	CA 20	CA 175	
		Sonoma County Line	Humboldt County Line	Sonoma County Line	Lake County Line	Lake County Line	Total
Highway 1	Sonoma County Line	0	127	0	0	4	131
US 101	Humboldt County Line	127	0	1,315	505	45	1,992
CA 128 / US 101	Sonoma County Line	0	1,315	0	393	35	1,743
CA 20	Lake County Line	0	505	393	0	0	898
CA 175	Lake County Line	4	45	35	0	0	84
Total		131	1,992	1,743	898	84	4,848
<b>2030 Through Trip Matrix</b>							
External Station		Highway 1	US 101	CA 128 / US 101	CA 20	CA 175	
		Sonoma County Line	Humboldt County Line	Sonoma County Line	Lake County Line	Lake County Line	Total
Highway 1	Sonoma County Line	0	137	0	0	4	141
US 101	Humboldt County Line	137	0	1,389	727	47	2,300
CA 128 / US 101	Sonoma County Line	0	1,389	0	513	33	1,935
CA 20	Lake County Line	0	727	513	0	0	1,240
CA 175	Lake County Line	4	47	33	0	0	84
Total		141	2,300	1,935	1,240	84	5,700

# **Appendix H**

## **Components of the Model**

**Mendocino Council of Governments (MCOG)  
Travel Demand Forecasting Model**

**October 2010**

**WC09-2631**

# COMPONENTS OF THE MODEL

## SOFTWARE PLATFORM

TransCAD 5.0 was chosen as the software package in which to create the MCOG TDF model and should be used for any application of this model. TransCAD is one of the few travel demand modeling software packages that was built using Geographic Information System (GIS) principles. Because of its GIS roots, TransCAD is easily able to integrate information from the County's existing GIS databases and can automatically export information into ESRI shapefile format.

## FILE AND FOLDER STRUCTURE

Note that all files with "2009" in their name refer to the 2009 (base year) model files. Similar files exist for 2020 and 2030 corresponding to the future year models.

Figure H-1 shows the model user interface (UI). The buttons on the user interface activate the various steps in the model. By default, all model steps can be run in a single operation by pressing the **Trip Generation** button. To complete these steps one at a time, check the **Stop after stage** box and then push the various buttons in sequence.

Figure H-2 shows the overall TransCAD model file structure. As shown at the top of Figure H-2, the model requires that some UI setup files be stored in the TransCAD software folder along with the TransCAD program. As shown in the lower section of Figure H-2, the model input files and output files can be stored either on the user's hard drive or in a local area network. The model setup files are described in detail below.

1. **Add-ins.TXT:** This setup file stores the information about the script file name and the name of model scenario. The contents should look something like this:
  2. M, gisdk\toolbox\gisdk, GISDK Start Toolbox, GIS Developer's Kit
  3. D, C:\MCOG\2009\Script\mcog\_2009\_ui.dbd, MCOG Model, Mendocino County Model 2009
4. **MCOG\_2009.INI:** This setup file stores the paths for some setup files and the model folder. The contents should look something like this:
  5. [Model Table]  
C:\MCOG\2009\MOD\_2006.bin
  6. [UI File]  
C:\MCOG\2009\Script\MCOG\_2009\_ui.dbd
  7. [Scenario File]  
C:\MCOG\2009\Scenario\_MCOG.arr
  8. [Data Directory]  
C:\MCOG\2009\
9. **Model Batch Script:** The model script, which is also known as the "resource" file (MCOG\_2009.rsc), controls the overall model flow and also produces a user interface similar to the one shown in Figure H-1. The script is written in a scripting language called GISDK, which is

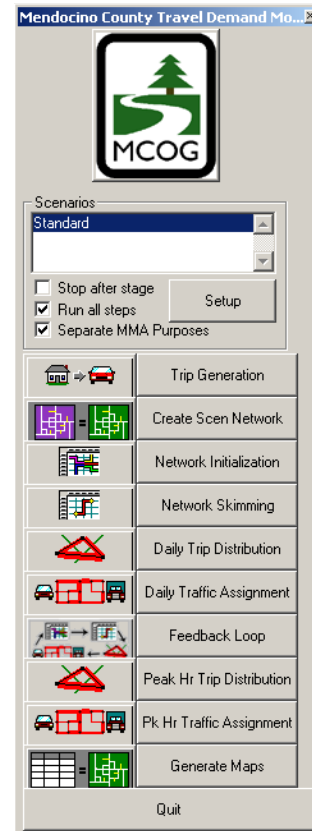
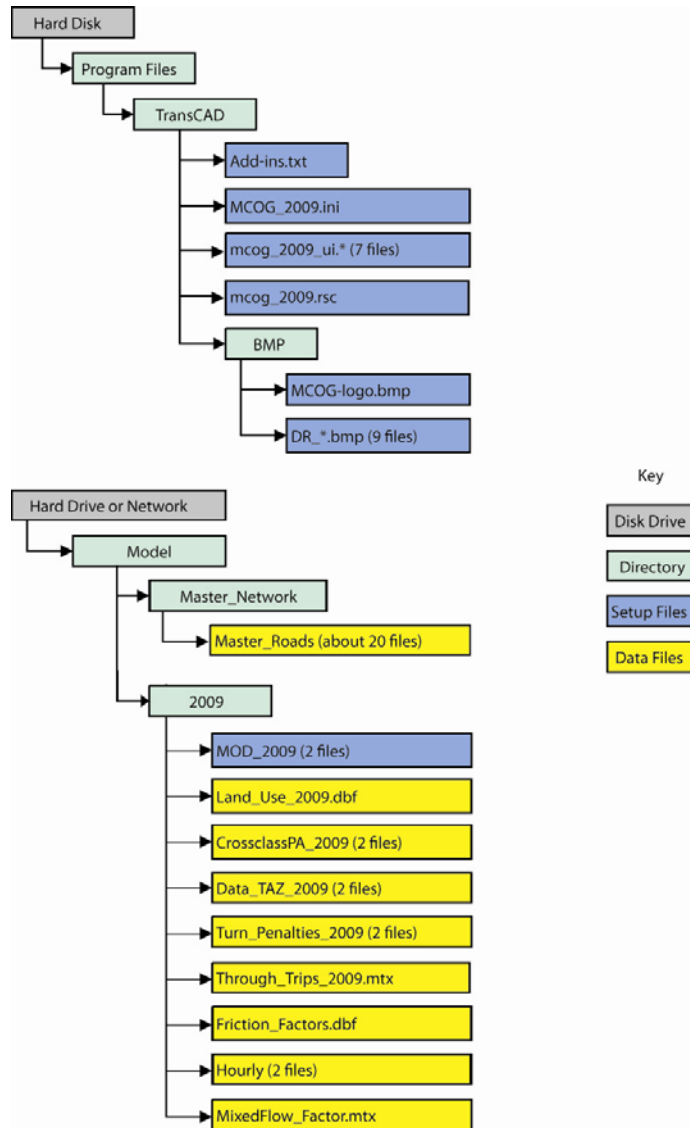


Figure H-1 – Model User Interface

used to set up and run TransCAD models. Because TransCAD script is a compiled language, the model script has been compiled and saved as MCOG\_2009\_ui.\* (seven files).



**Figure H-2 – File and Folder Structure**

10. **BMP Files:** The MCOG logo (MCOG-logo.BMP) and the icons (DR\_\*.BMP) for the buttons should be stored in the BMP folder under TransCAD program folder.
11. **MOD\_2009.BIN:** This setup file stores the names of the model input and output files, the model parameters, and other setup information.

## OVERVIEW OF MODEL COMPONENTS

The model consists of three kinds of components:

- Input data – The input data are files that represent different aspects of the County’s road system, land use, and travel characteristics.
- Model steps – The model steps are the mathematical calculations that the model completes in determining traffic flows. These steps are performed by model batch script.
- Model outputs – The model outputs are data files produced by the model, and some are inputs to other steps in the model.



Figure H-3 shows the relationship between input and output files. The individual components are described below for each step of the TDF model (trip generation, trip distribution, mode choice, and trip assignment).

### Trip Generation

1. **Land Use Table (*Land\_Use\_2009.DBF*):** This input file stores the land use characteristics of the traffic analysis zones (TAZs) and the external station weights.

The land use data includes such items as the number of single- and multi-family dwelling units (DUs), and the number of jobs for commercial, office, industrial, and other non-residential land uses.

External station weights show the relative amount of traffic traveling to and from each external station. These factors are used to distribute the internal-to-external and external-to-internal trip productions and attractions in the MCOG model.

2. **Trip Generation Rates (*CrossClassPA\_2009.BIN*):** This input file stores the trip generation rates by trip purpose and trip rate area. For example, trips from home to work (i.e., home-based work) and trips from home to a store (i.e., home-based other) have separate trip generation rates for each land use category. In addition, different geographical areas with Mendocino County have different residential trip generation rates, as shown in section 3 of this report.
3. **Data in TAZ (*Data\_TAZ\_2009.BIN*):** This input file stores the model input data in TAZ format other than land use. These data include dwelling occupancy rates, terminal times and 3D inputs. Currently, none of these features contain values which affect the results of the model, but they are included for potential future enhancements to the model.

The dwelling occupancy rates represent the percentage of residences which are occupied. The terminal times represent the time needed at the start and end of each trip to accomplish tasks such as looking for a parking place and walking from the car to the destination. These values, which are entered in minutes, are added to the time it takes to travel between each TAZ pair.

This file also stores information about the elasticity of trip-generation to the Density, Diversity, and Design characteristics of each TAZ. It also stores 3D input data on a Base Case and a Scenario for comparative purposes.<sup>1</sup>

4. **Trip Generation Step:** This step multiplies the land use table by the trip generation rates to produce an initial estimate of trip ends. The model then balances the trip production and attraction estimates based on the script file. The model will hold to either productions or attractions, and then factor the other estimate up or down until it equals the selected control. For most trip purposes, the model's default is to adjust attractions to balance to productions.
5. **Unbalanced Trip Ends (*PA\_Unbalanced.BIN*):** This output file stores the vehicle trip productions and attractions by trip purpose before the trip-end balancing procedure.
6. **Compare 3D Characteristics Step:** This step is a part of trip generation that calculates the 3D adjustment factors.<sup>2</sup>
7. **3D Adjustment (*Data\_TAZ\_2009.BIN*):** This file stores the updated 3D adjustment factors.
8. **3D Adjustment Step:** This step is a part of trip generation that applies the 3D adjustment factors to the unbalanced trip ends.
9. **Adjusted Trip Ends (*PA\_Unbalanced.BIN*):** This file stores the adjusted trip ends by the 3D factors before the trip-end balancing procedure.
10. **Balanced Trip Ends (*PA\_Balanced.BIN*):** This output file stores the model estimate of vehicle trips for each trip purpose that begin or end in each TAZ.

---

<sup>1</sup> Please note that while the MCOG TDF model is structured to include the 3D model adjustments as part of a future update, the factors are not currently calibrated or implemented in the model.

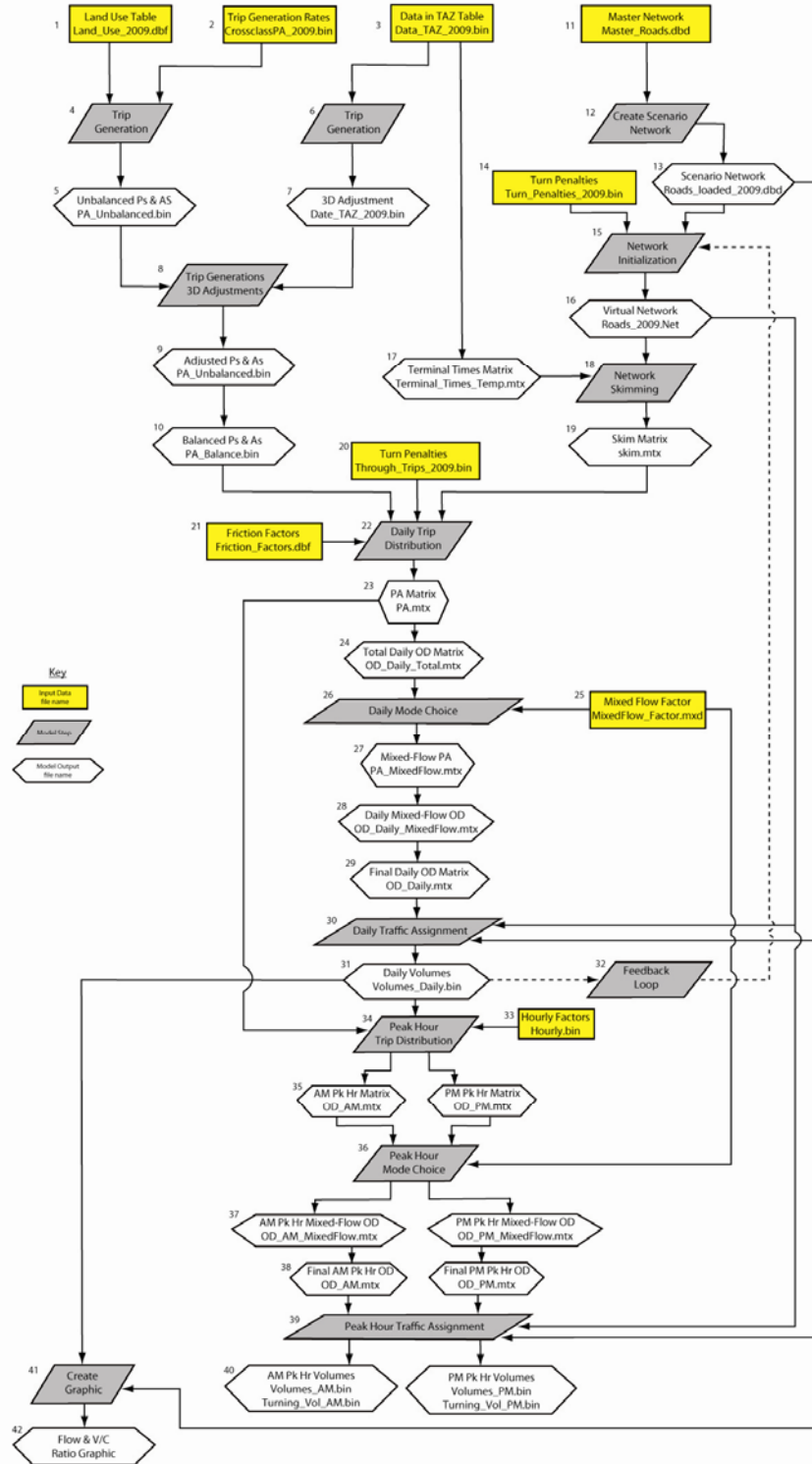
<sup>2</sup> Please note that the 3D adjustment is not implemented in this version of the model.

### Create Scenario Network

11. **Master Network (*MCOG\_Master.\*\*\**)**: This input file is a master roadway network that contains roadway networks for all scenarios (existing roadways and future roadway improvements). This is a family of files showing the length, location, free-flow speed, capacity, and other characteristics of the roadways in the study area.
12. **Create Scenario Network Step**: This step creates a scenario-specific highway network file from the master highway network file.
13. **Scenario Network (*Roads\_Loaded\_2009.DBD*)**: This output file is a scenario-specific network generated in the Master Network step. This is a family of files showing the length, location, free-flow speed, capacity, and other characteristics for the specific model year.

### Network Initialization

14. **Turn Penalty Table (*Turn Penalties\_2009.BIN*)**: This input file stores the turning prohibition or delay for specific turning movements in the model network.
15. **Network Initialization Step**: In this step, the model takes the highway network data and stores it in a format used by TransCAD.



**Figure H-3 – Components of the MCOG TDF Model**

**16. Virtual Network (*Roads\_Loaded\_2009.NET*):** This output file is a special TransCAD data structure that stores important highway network data and the turn penalty information. The contents in this file cannot be viewed visually.

### Network Skimming

**17. Terminal Times Matrix (*Terminal\_Times\_Temp.MTX*):** This is a temporary output file that stores the terminal times values in a matrix format.

18. **Network Skimming Step:** This step measures travel times for all possible routes between each pair of TAZs, based on the information contained in the highway network, and determines the shortest route. Then it adds the terminal times.
19. **Skim Matrix (*Skim.MTX*):** This output file stores the shortest travel time between each pair of TAZs, including the terminal times. The data is stored in the form of a TAZ-to-TAZ matrix, with each cell showing the shortest travel time in minutes between each pair of zones.

#### Daily Trip Distribution

20. **Friction Factors (*Friction\_Factors.DBF*):** This input file contains factors determining the relative attractiveness (by trip purpose) of each destination zone based on the travel time between TAZs and the number of potential origins and destinations in each TAZ.
21. **Through Trips (*Through\_Trips\_2009.MTX*):** This input file contains the number of through trips, in the form of an origin-destination (OD) matrix for external TAZs.
22. **Daily Trip Distribution Step:** This step uses four input files from Steps 10, 19, 20, and 21 to determine how trips are distributed among productions and attractions. It then converts them into the origin-destination pairs for the 24-hour period.
23. **Production-Attraction Matrix (*PA.MTX*):** This output file contains the trips from the trip generation plus the through trips. This is an intermediate product before determining the directionality of trips.
24. **Total Daily OD Matrix (*OD\_Daily\_Total.MTX*):** This output file stores the daily OD trips before they are split into trips using mixed-flow lanes and High-Occupancy Vehicle (HOV) lanes.

#### Daily HOV-SOV Mode Choice<sup>3</sup>

25. **Mixed-Flow Factor Matrix (*MixedFlow\_Factor.MTX*):** This input file stores factors representing the proportion of trips using mixed-flow lanes for each OD pair.
26. **Daily Mode Choice Step:** This step splits the vehicle-trip table into trips using mixed-flow lanes and high occupancy vehicle (HOV) lanes.
27. **Mixed-Flow PA Matrix (*PA\_MixedFlow.MTX*):** This output file stores PA trips that are restricted to HOV lanes.
28. **Daily Mixed-Flow OD Matrix (*OD\_Daily\_MixedFlow.MTX*):** This output file stores the daily OD trips that are restricted to HOV lanes.
29. **Final Daily OD Matrix (*OD\_Daily.MTX*):** This output file stores the final daily OD tables: Mixed-Flow and HOV lane trip tables.

#### Daily Traffic Assignment

30. **Daily Traffic Assignment Step:** The model uses an iterative assignment process whereby the quickest route is determined for each of the trips in the daily OD matrix, taking into account congestion caused by other trips.
31. **Daily Volumes (*Volumes\_Daily.BIN*):** This output file stores the daily model volumes and other outputs on each link.

#### Feedback Loop

32. **Feedback Loop Step:** In this step, the model feeds the congested travel time back into the network initialization step and repeats steps 15 through 31.

---

<sup>3</sup> Currently, Mendocino County has no HOV lanes, so there is no need to split the trips into HOV and SOV components. While this feature is built into the model, the parameters have not been enabled and the model has not been calibrated for HOV usage.

### Peak Hour Trip Distribution

33. **Hourly Factors (*Hourly.BIN*):** This input file factors the daily OD matrix into the AM and PM Peak Hour OD matrices.
34. **Peak Hour Trip Distribution Step:** The model uses an iterative assignment process that determines the quickest route for each trip in the AM and PM peak hour OD matrices, taking into account congestion caused by other trips.
35. **Total AM and PM Peak Hour OD Matrices (*OD\_AM\_Total.MTX, OD\_PM\_Total.MTX*):** These output files store the number of trips between each OD pair for the AM and PM peak hours.

### Peak Hour HOV-SOV Mode Choice<sup>4</sup>

36. **Peak Hour Mode Choice Step:** Similar to the daily mode choice step, the peak hour OD matrices are split into Mixed-Flow and HOV trip tables in this step.
37. **AM and PM Peak Hour Mixed-Flow OD Matrices (*OD\_AM\_MixedFlow.MTX, OD\_PM\_MixedFlow.MTX*):** These output files store the AM and PM peak hour OD trips that are restricted to HOV lanes.
38. **Final AM and PM Peak Hour OD Matrices (*OD\_AM.MTX, OD\_PM.MTX*):** These output files store the final AM and PM peak hour OD tables: Mixed-Flow and HOV lane trip tables.

### Peak Hour Traffic Assignment

39. **Peak Hour Traffic Assignment Step:** The model uses an iterative assignment process that determines the quickest route for each trip in the AM and PM peak hour OD matrices, taking into account congestion caused by other trips.
40. **AM and PM Peak Hour Volumes (*Volumes\_AM.BIN, Volumes\_PM.BIN, Turning\_Vol\_AM.BIN, Turning\_Vol\_PM.BIN*):** *Volumes\_AM.BIN* and *Volumes\_PM.BIN* store the AM and PM peak hour model volumes and other outputs on each link. *Turning\_Vol\_AM.BIN* and *Turning\_Vol\_PM.BIN* store the turning movement volumes at the study intersections for the AM and PM peak hours.

### Create Graphic

41. **Create Graphic Step:** This step automatically produces a model network map showing the traffic volume as a bandwidth and congestion as a color code.
42. **Flow and V/C Ratio Graphic:** This graphic is useful to produce because it shows daily traffic volumes as a bandwidth and the volume/capacity ratio as a color code. This graphic can be saved as an image file such as JPEG or BMP for use with other software packages, such as embedding it in a report done in Microsoft Word.

---

<sup>4</sup> Currently, Mendocino County has no HOV lanes, so there is no need to split the trips into HOV and SOV components. While this feature is built into the model, the parameters have not been enabled and the model has not been calibrated for HOV usage.

**TABLE H-1  
ATTRIBUTES IN MODEL NETWORK**

Field	Description
<b>Link Layer Attributes</b>	
<b>DIR</b>	0=Two-Way, 1=One-Way (AB Direction Only) , -1=One-Way (BA Direction only)
<b>FUNC_CLASS</b>	Description of functional classification
<b>NAME</b>	Street Name
<b>YR_BUILT</b>	Construction year (all existing roads are coded as being in the network as of the year 2009; all future roads are coded with the expected year of construction)  Base Year: YR_BUILT = 2009 and (AB_LANE_09 > 0 or BA_LANE_09 > 0) Year 2020: YR_BUILT <= 2020 and (AB_LANE_20 > 0 or BA_LANE_20 > 0) Year 2030: YR_BUILT <= 2030 and (AB_LANE_30 > 0 or BA_LANE_30 > 0)
<b>FROM_ID / TO_ID</b>	Manually populated A node / B node
<b>LANE_CAPAC</b>	Hourly capacity per lane
<b>AB_LANE_09 / BA_LANE_09</b>	Number of lanes in AB and BA direction in Model Year 2009
<b>AB_LANE_20 / BA_LANE_20</b>	Number of lanes in AB and BA direction in Model Year 2020
<b>AB_LANE_30 / BA_LANE_30</b>	Number of lanes in AB and BA direction in Model Year 2030
<b>AB_AUX / BA_AUX</b>	Auxiliary lane in AB and BA direction
<b>HOV_LINK</b>	Identification of HOV (high-occupancy vehicle) links. Links with any numeric value will be considered as HOV links
<b>AB_SPEED / BA_SPEED</b>	Free-flow speed in AB and BA direction
<b>POST_SPEED</b>	Posted Speed (for notes only – not used in model)
<b>AB_TIME / BA_TIME</b>	Place holders for free-flow travel time in minutes. These fields will be calculated automatically.
<b>AB_CONGTT / BA_CONGTT</b>	Place holders for congested travel time in minutes. These fields will be calculated automatically.
<b>ALPHA</b>	Alpha parameter of Bureau of Public Roads (BPR) equation, varies by functional class
<b>BETA</b>	Beta parameter of BPR equation, varies by functional class
<b>COUNTID</b>	An index used to identify traffic count locations for validation
<b>CNT_*</b>	Traffic counts (daily, AM peak hour, and PM peak hour)
<b>Max_Dev_*</b>	Caltrans' maximum allowable deviation for corresponding traffic counts
<b>SCRNLINE_ID</b>	An index to used to identify screenline locations for validation
<b>Load*</b>	Place holders for loaded link volumes for daily, AM peak hour, and PM peak hour. These fields will be filled automatically.
<b>Node Layer Attributes</b>	
<b>TAZ</b>	TAZ number for each centroid
<b>Study_Intersection</b>	Identification of study intersections. The turning movement volumes will be populated for nodes with any numeric value.

Notes: **Bold** indicates the input network fields.

Other fields in the model network are kept for informational purposes.

Network attributes with AB and BA labels store directional information. If a link is drawn from point A to point B, the point A to point B direction is the AB direction, and it is also called topology direction.