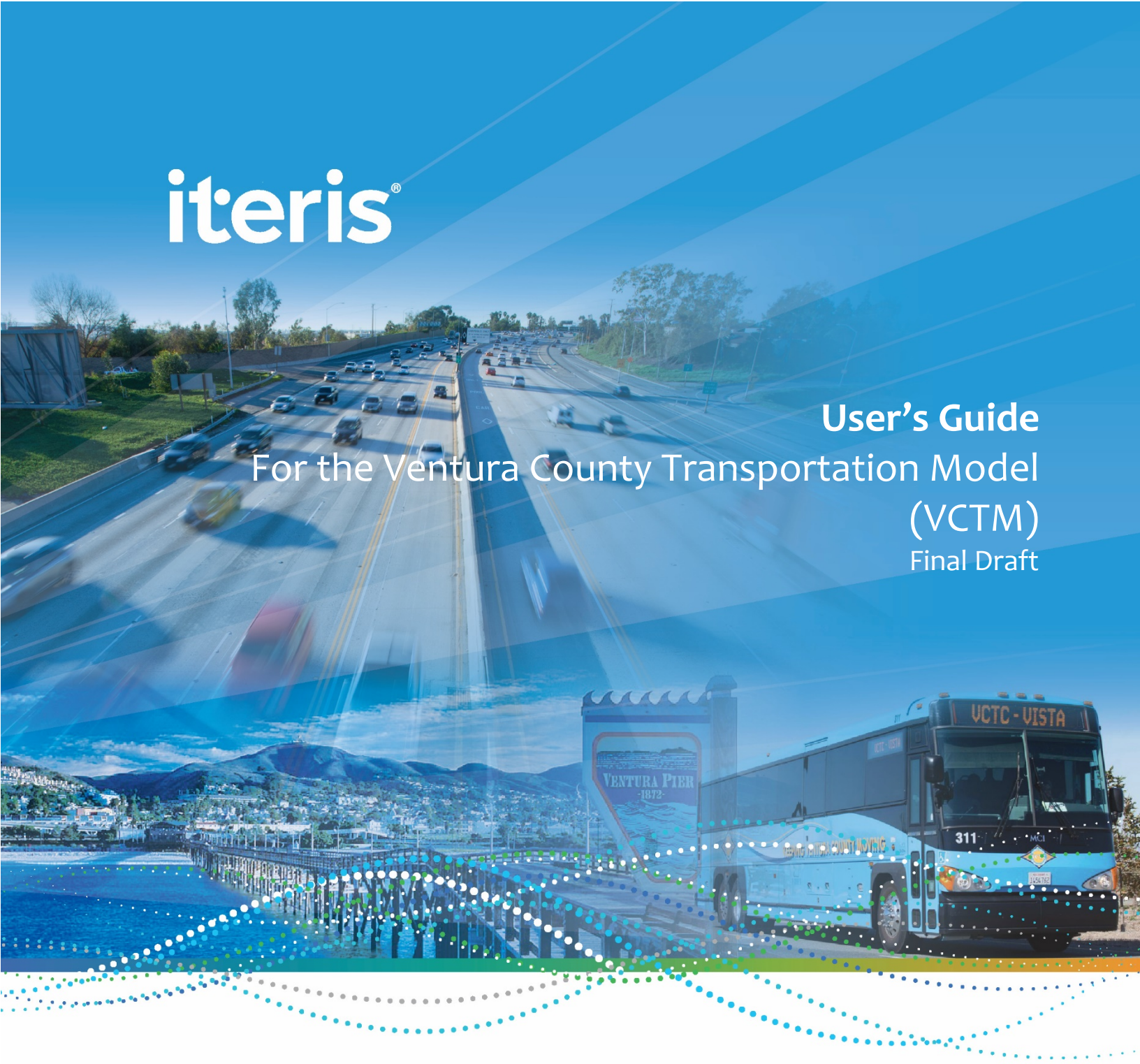



# User's Guide

## For the Ventura County Transportation Model (VCTM)

Final Draft

**November 28, 2018**

Submitted to:

Ventura County Transportation Commission (VCTC)

05109.19/17J17-0131.17 | Prepared by **Iteris, Inc.**

Innovating Through Informatics™

# TABLE OF CONTENTS



## APPENIDIX

## TABLES



## FIGURES

# 1 INTRODUCTION

This User's Guide is prepared to assist the modelers to use the Ventura County Transportation Model's (VCTM) custom User Interface in TransCAD 6.0 (TransCAD Version 6.0 r2 Build 9215). This guide also explains the location of all input/output files as well as how to update the various components and run the model. It is assumed that the user is familiar with the basic 4-step Travel Demand Modeling process and the use of the TransCAD software package.

All the components and parameters used in developing the model are described in the VCTM Model Development and Validation for the Ventura County Transportation Model (VCTM) document dated November 7, 2018.

**Appendix A** is the full documentation of the SCAG User's Guide for the SCAG RTP2012 Panning Model in TransCAD 6.0, dated October 2012, and prepared by Caliper Corporation. Throughout this document, this will be referred to as the "SCAG Model User's Guide".

The VCTM is largely based on the SCAG 2016 RTP/SCS travel demand model, which is referred to in this document as the "2016 SCAG model".

## 1.1 Model Overview

The Updated VCTM consists of the same stages as the SCAG regional trip-based model:

- Initialization
- Network Skimming
- Trip Generation
- Trip Distribution
- Modal Split
- Time of Day Models
- Trip Assignment

As part of the VCTM update, additional model enhancements were added to the model. The Updated VCTM largely replicates the 2016 SCAG Model structure, with five key additions:

- Land Use to Socioeconomic Data Conversion
- Inclusion of Special Generators in Trip Generation
- Enhancement of Active Transportation in Mode Choice
- Enhanced and Focused Assignment Output Capabilities
    - Reporting of turn movements at designated nodes
    - Automated exporting of model outputs for link and load attributes
- Specialized and Standardized Performance Measure Outputs
    - Automated spreadsheet for VMT, VHT, and VHD by link and by zone
    - Automated air quality conformity analysis spreadsheet (VMT by speed bin)

**Figure 1-1** illustrates the basic VCTM flow chart, including model improvements developed for the Updated VCTM. **Figure 1-2** illustrates the detailed VCTM flow chart (as developed by the SMDT) with enhanced capabilities and model additions shown in red arrows.

**Figure 1-1: VCTM Flow-Chart**

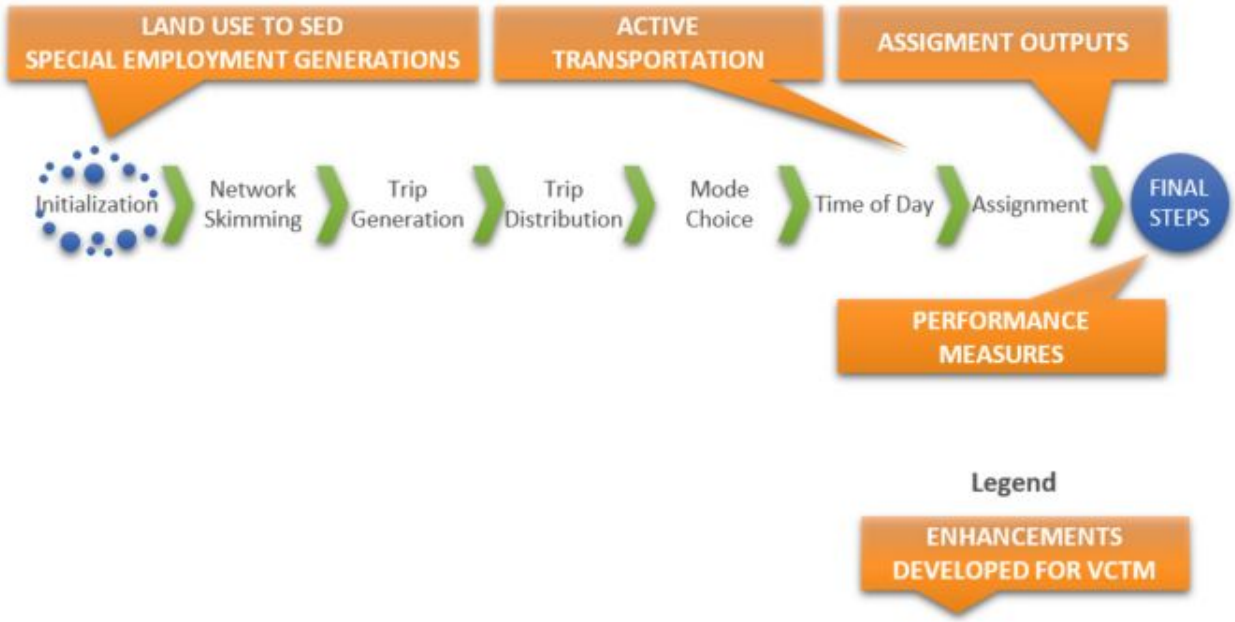
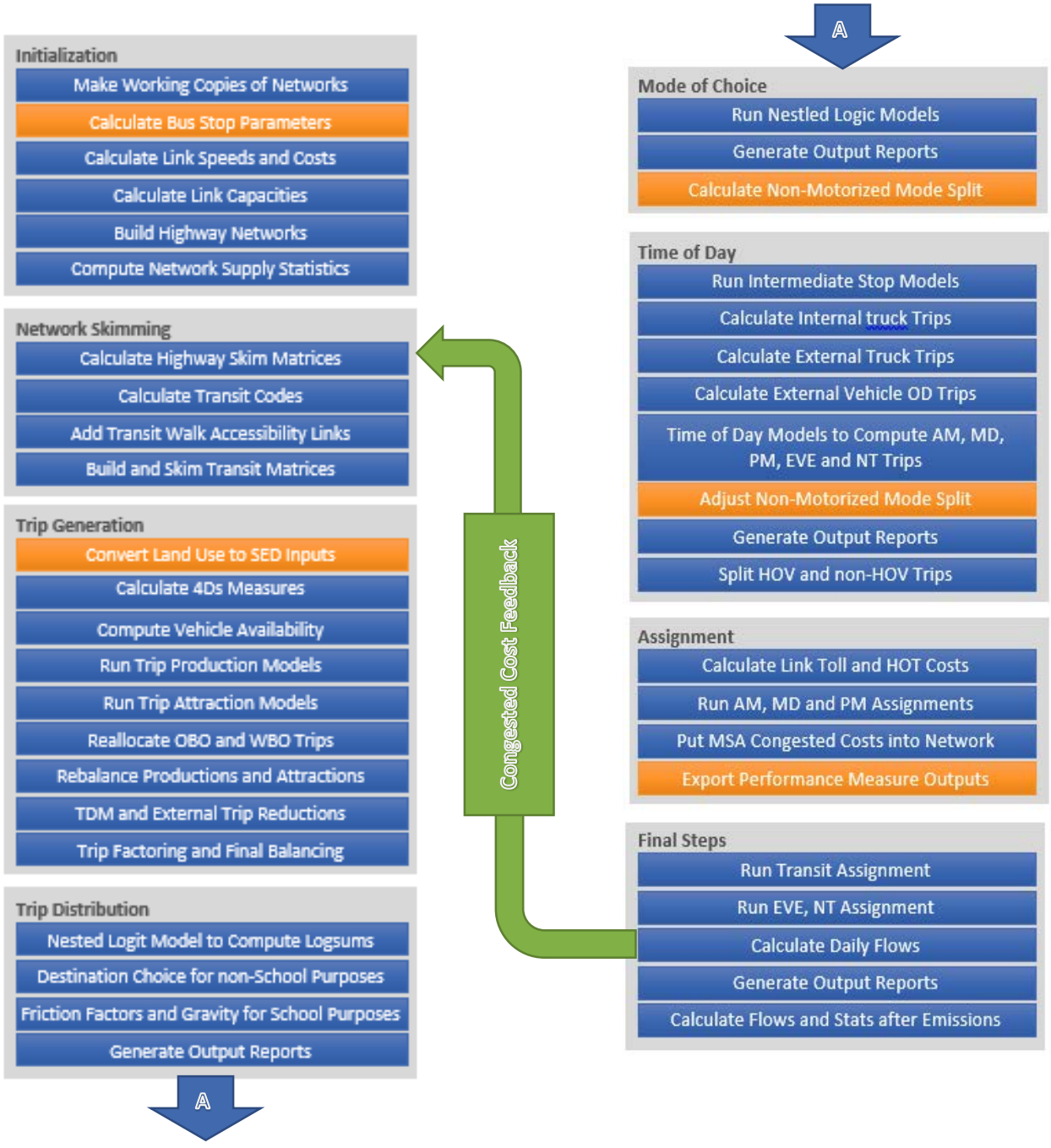


**Figure 1-2: Detailed SCAG Flow-Chart with VCTM Enhancements**



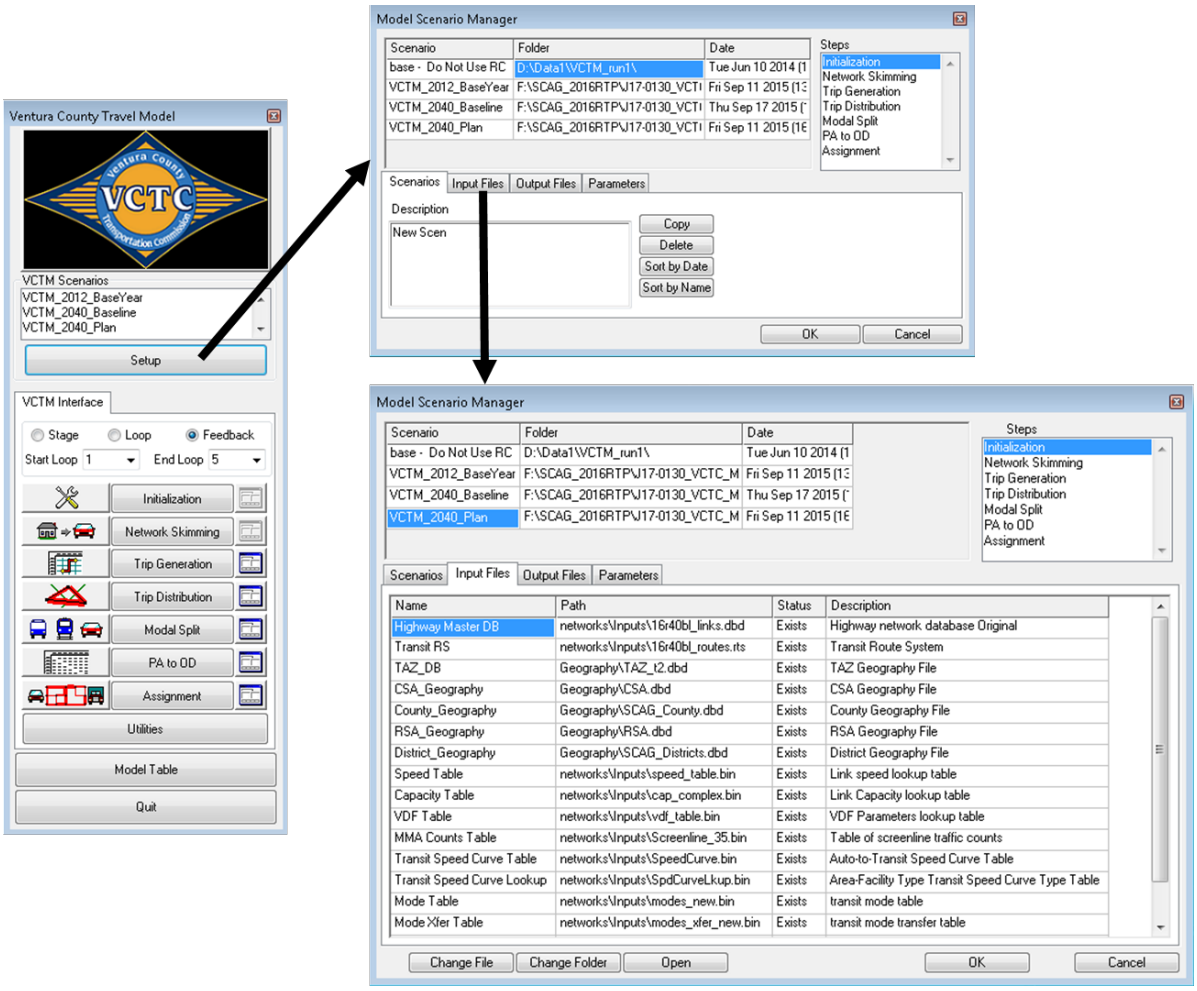
## 1.2 TransCAD User Interface

The model can be run by click of a button using a custom interface. This custom interface needs to be complied in TransCAD using the Add-in feature. The procedures to add the User Interface (UI) are described in this document.

# 2 MODEL USERS' GUIDE

This user's guide is intended to assist in understanding how to run the travel demand model, and understand the model inputs and outputs. The UPDATED VCTM model is a custom Add-in in TransCAD software. **Figure 2-1** shows the three main add-in components of the travel model, which will be discussed in detail in the following sections.

**Figure 2-1: Model Add-in Components**



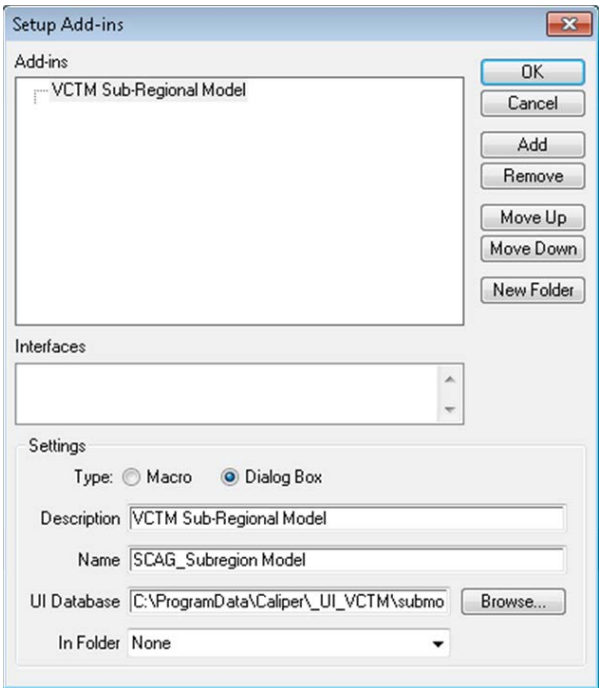
## 2.1 Installing the VCTM Add-In

The VCTM add-in is a customized version of the SCAG 2016 RTP travel demand model, and is packaged in an easy-to-install package. In order to install the VCTM model, all files in the VCTM_Model_Install_Files.zip folder need to be unzipped the TransCAD folder on the desired machine. (For example, TransCAD may be located at the following location: C:\Program Files\TransCAD60_Bld9125_SCAG2016RTPSCS).

*Note: The VCTM model requires TransCAD Version 6.0 r2 Build 9215 64-bit build dated March 19, 2015. TransCAD v7.0 is not supported. Please contact Caliper to download this version.*

1. copy everything in =under_ProgramData_Caliper folder into C:\ProgramData\Caliper\
2. Copy everything in =under_transcad_program folder into your TransCAD program folder. Example: C:\Program Files\TransCAD 6.0\
3. Launch TransCAD
4. Create a model Add-in in TransCAD as shown in **Figure 2-2**. To access menu to set up add-ins, access the TransCAD menu bar, Choose Tools > Setup Add-ins.
    a. Select 'Dialog Box'
    b. Write a custom description such as "VCTM Sub-Regional Model"
    c. 'Name' must be filled as "SCAG_Subregion Model" without the quotes.
    d. Point the UI Database to "C:\ProgramData\Caliper_UI_VCTM\submod_v63.dbd"
    e. Click OK to complete setting up the Add-in
5. When you open the add-in, be sure to point the model table to the included setting table file SCAGModelv63q.bin, located in the following folder: C:\ProgramData\Caliper_UI_VCTM\.

**Figure 2-2: Install VCTM Model Add-In**

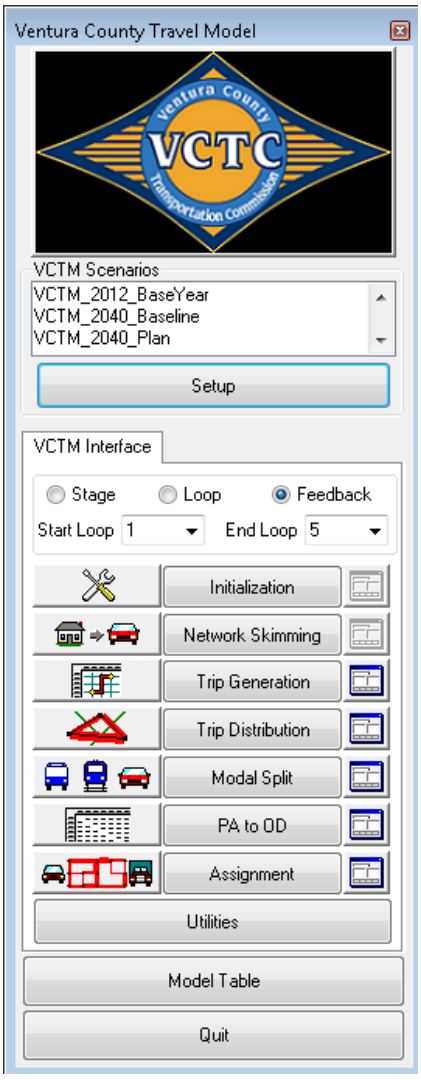


## 2.2 Launching the VCTM Add-In

Following installation of the VCTM add-in, the add-in can be opened through the TransCAD menu bar, Choose Tools > Add-ins. **Figure 2-3** illustrates the VCTM Model Add-In.

*Note: When first accessing the add-in, access the Model Table by pointing to SCAGModelv63q.bin, located in the following folder: C:\ProgramData\Caliper_UI_VCTM\.*

**Figure 2-3: VCTM Model Add-In**



## 2.3 Running the VCTM Add-In

In order to run the model, the following simple steps must be followed:

1. Select preferred VCTM Scenario.
2. Open "Setup" and verify parameters using the model scenario manager, as illustrated in **Figure 2-4**.
    a. Locate the project folder.
    b. Copy 2012 Base Year Scenario to develop new base year scenario, and 2040 Baseline scenario to develop a new future baseline scenario.
3. Verify input files, output files, and parameters for each model Step. An example of input files is illustrated in **Figure 2-5**. Note that if using the model table delivered in the model installation package, none of the parameters should be modified, and all of the model input files are present in the correct location.
4. To run the model:
    a. To run each step independently, set the VCTM Interface to "Stage" and run the desired step.
    b. To run each loop independently, set the VCTM Interface to "Loop", determine the "Start Loop", and run each loop independently by clicking on "Initialization".
    c. To run a feedback model run including a full loop plus a final loop, set the VCTM Interface to "Feedback", determine the "Start Loop" and "End Loop", and run the feedback scenario by clicking on "Initialization". *(Note that a full feedback model run is inclusive of "Start Loop" of 1 and "End Loop" of 5).*

**Figure 2-4: VCTM Model Scenario Manager**

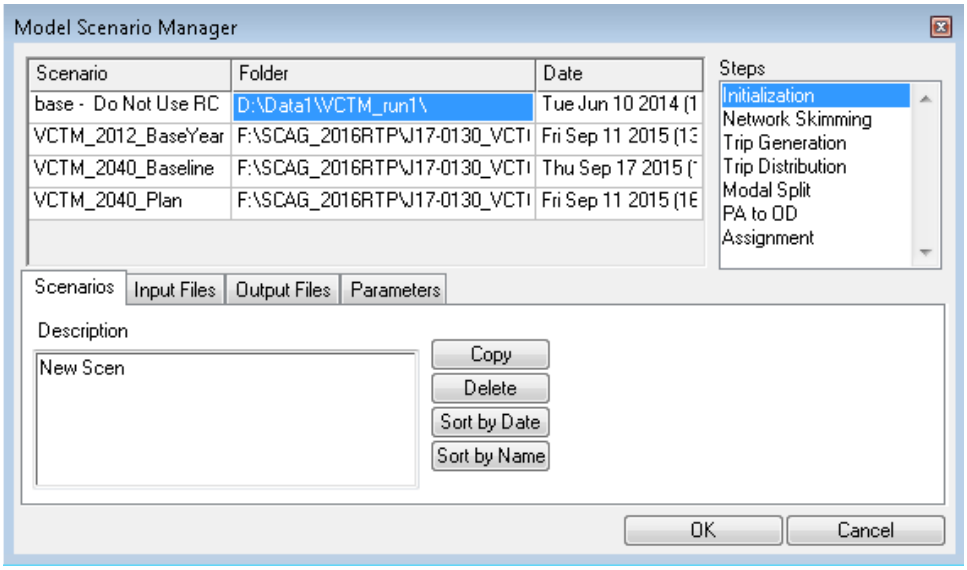
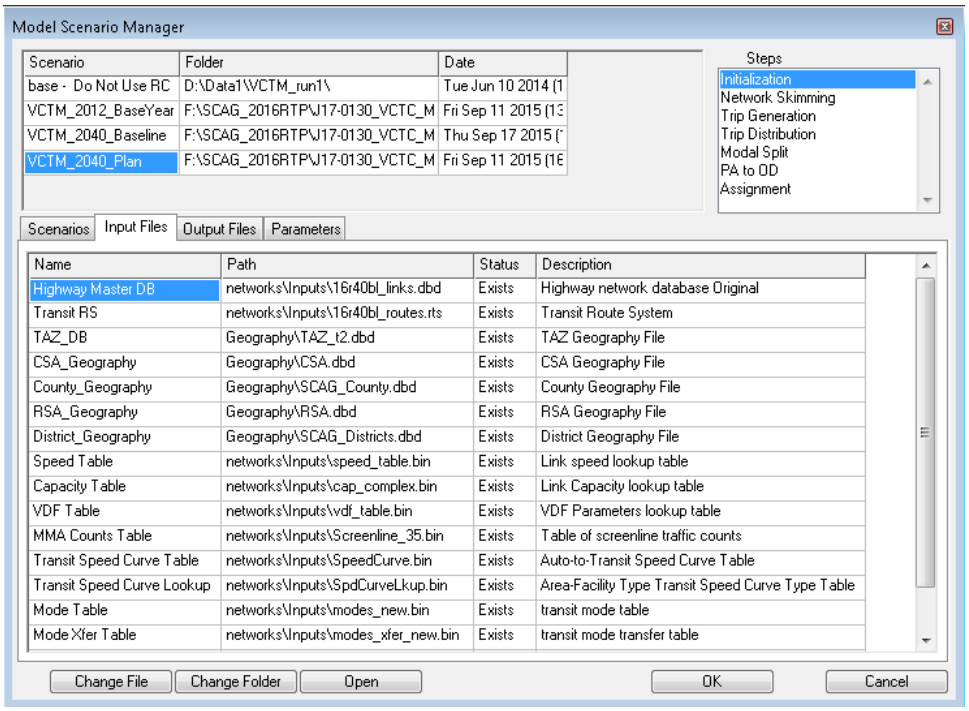


**Figure 2-5: VCTM Model Scenario Manager Initialization Input Files**



# 3 MODEL COMPONENTS

This section of the report details the inputs and outputs of each of the model steps. SCAG Model User's Guide.

## 3.1 Traffic Analysis Zones

The trip generation component of the model stream utilizes a zonal geography. The zonal geography is identified by the file titled *TAZ_t2.dbd* which is located in the geography folder for each scenario. The zone structure for the VCTM model is contained in the file \Geography\TAZ_t2.dbd for each scenario. **Table 3-1** summarizes TAZ_t2.dbd attributes. Information on additional input files related to the TAZs are discussed in **Appendix A**.

**Table 3-1: VCTM TAZ Geography Dictionary**

| FIELD | DESCRIPTION |
|---|---|
| Geography\TAZ_t2.dbd | |
| ID | TAZ Number |
| Area | Area in Square Miles |
| CNTY | County Number<br>1. Imperial County<br>2. Los Angeles County<br>3. Orange County<br>4. Riverside County<br>5. San Bernardino County<br>6. Ventura County |
| CountyName | County Name |
| CityName | City Name |
| RSA | Regional Statistical Area (RSA) Number |
| CSA | Community Statistical Area (CSA) Number |
| AIR_BASIN | Air Basin Number<br>1. SCCAB<br>2. SCAG<br>3. MDAB<br>4. SSAB |
| SUB_AIR_BASIN | Sub Air Basin |
| ZoneType | "Internal" |

| FIELD | DESCRIPTION |
|---|---|
| Geography\TAZ_t2.dbd | |
| VCTC_District/<br>VCTC_District2 | VCTM District Number and Name (General Plan Districts)<br>1. Ojai Area<br>2. Ventura Area<br>3. Oxnard Area<br>4. Port Hueneme Area<br>5. Santa Paula Area<br>6. Las Posas Area<br>7. Camarillo Area<br>8. Fillmore Area<br>9. Moorpark Area<br>10. Thousand Oaks Area<br>11. Piru Area<br>12. Simi Valley Area<br>13. Oak Park Area<br>14. Ahmanson Ranch Area<br>100. Unincorporated Ventura County Area |
| VCTC_TIMF/<br>VCTC_TIMF2 | VCTM Traffic Impact Mitigation Fee District Number and Name<br>1. North County<br>2. Ventura<br>3. Oxnard<br>4. Central County<br>5. Camarillo<br>6. Thousand Oaks<br>7. Moorpark<br>8. Simi Valley |
| VCTC_City | City Name |
| AREA_BUS_25 | Area (square miles) of zone within a quarter mile of a bus stop |
| AREA_BUS_50 | Area (square miles) of a zone within a half mile of a bus stop |
| AREA_RAIL_25 | Area (square miles) of a zone within a quarter mile of a rail stop |
| AREA_RAIL_50 | Area (square miles) of a zone within a half mile of a rail stop |
| MU_INDEX | Mixed-Use Index of the Zone as calculated by the VCTM Model During the Initialization Stage |
| SEQ_INTERNAL | Internal Sequence of Ventura County Model Zones<br>• 83-745 represent Ventura County Zones<br>• All other zones are null |

**Figure 3-1** illustrates the zone structure within the Updated VCTM for Ventura Count and **Table 3-2** summarizes the VCTM zone structure for the current and Updated VCTM.

**Figure 3-1: VCTM TAZ Structure**

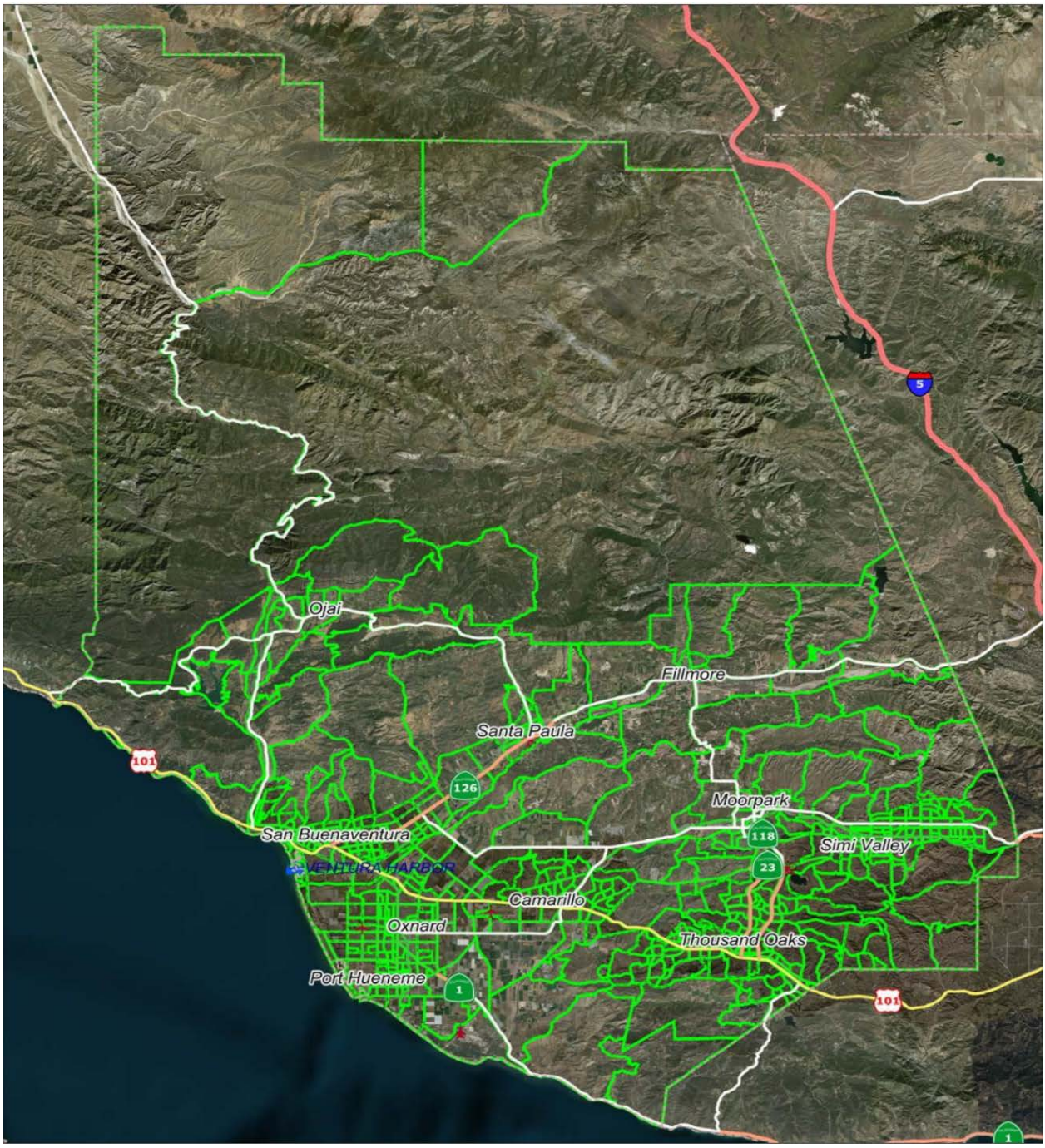


**Table 3-2: VCTM Zone Structure**

| MODEL AREA | CURRENT VCTM | | | UPDATED VCTM |
|---|---|---|---|---|
| | Number of Zones | Zone Sequence | Number Of Zones | Zone Sequence |
| Imperial County | NA | NA | 24 | 110001000-110369000 |
| Los Angeles County | 141 | 516-656 | 247 | 20211000-20733000, 120016000-120368000 |
| Orange County | 9 | 657-665 | 52 | 130171000-130338000 |
| Riverside County | 18 | 666-683 | 49 | 140214000-140349000 |
| San Bernardino County | 10 | 684-693 | 44 | 150252000-150359000 |
| Ventura County | 515 | 1-515 | 663 | 60001101-60210401 |
| External Zones | 28 | 694-721 | 40 | 16727000-16933000, 26205000-26211000, 36940000, 46626000-46939000, 56212000-56625000, 66101000-66204000 |
| Air and Port Zones | NA | NA | 43 | 17006000, 27002000-28031000, 37007000, 47008000-47009000, 57010000-57012000, 67001000 |
| **Total** | **721** | | **1,163** | |

## 3.2 Highway Network

The highway network serves as the basis for traffic assignment in the VCTM model. The roadway geographic file is located in the networks\inputs folder for each scenario, and is named by the user. The transit routes file is located in the networks\inputs folder for each scenario, and is also named by the user. Additionally, turn penalties and prohibitions are allowed within the VCTM model, and is identified in the networks\inputs\turnpen.bin file for each scenario.

**Table 3-3** summarizes highway network and transit routes attributes. A description of attributes in the turn penalty file is summarized in **Table 3-4.** Information on additional input files related to model networks are discussed in **Appendix A**.

**Table 3-3: VCTM Highway and Transit Network Dictionary**

| FIELD | DESCRIPTION |
|---|---|
| Networks\Inputs\ 16r12by_links.dbd | |
| ID | Link ID number |
| Length | Length in miles |
| Dir | Topological Direction of link<br>1=Direction from A node to B node<br>0=Two-way link<br>-1=Direction from B node to A node |
| FTIP_Project<br>FTIP_Project_ID1<br>FTIP_Project_ID2 | FTIP project identifier<br>_ID1 and _ID2 and _ID3 represent multiple FTIP projects at same location |

| FIELD | DESCRIPTION |
|---|---|
| FTIP_Project_ID3 | |
| RTP_Project<br>RTP_Project_ID1<br>RTP_Project_ID2<br>RTP_Project_ID3 | RIP project identifier<br>_ID1, _ID2, and _ID3 represent multiple RIP projects at same location |
| Road Name | Road Name |
| Route Name | Route Name |
| Route Number | Route Number |
| AB/BA_COUNTID | Count Identifiers as located in Screenlines and CountVolumeCompare analysisspreadsheets |
| AB/BA_Facility_Type | Link Facility Coding |
| AB/BA_PostedSpeed | Posted Speed Limit |
| AB/BA_<AM/PM/MD/EVE/NT>LANES | Number of one-directional lanes by time period including all auxiliary, thru and other lanes |
| FWY_Main_Lane | Number of freeway main lanes |
| FWY_Aux_Lane | Number of freeway auxiliary lanes |
| FWY_Acc_Dec_Lane | Number of Other freeway lanes |
| TRUCK_CLIMB | Flag field to indicate truck climbing link<br>• 0=None<br>• 1=1 Truck Climbing Lane<br>• 2=2 Truck Climbing Lanes<br>• 3=3+ Truck Climbing Lanes |
| Toll_flag | Flag field to indicate toll facility<br>• 0=None<br>• 1=toll road<br>• 2=HOT road |
| AB/BA_Per_Mile_Toll_Group_Auto | Toll link group to be used to calculate per-mile toll for autos |
| AB/BA_Per_Mile_Toll_Group_Truck | Toll link group to be used to calculate per-mile toll for trucks |
| AVOID_DA/SR2/SR3 | Ratio (between zero and one) that users can avoid the toll by choosing other routes in a toll scenario (e.g. HOT lanes). Used to apply a "discount" factor for certain toll scenarios in the TOD trip shifting and trip suppression models. |
| HOV_FLAG | Flag to indicate HOV link<br>• 0=Standard HOV<br>• 1=HOV AM Peak Only<br>• 2=HOV PM Peak Only<br>• 3=HOV AM & PM Peak Only |
| TRUCK_Prohibit_Flag | Flag field to indicate a truck prohibition<br>• 0=truck not prohibited<br>• 1=trucks prohibited |
| Signals_flag | Flag field to indicate Advanced signals lane<br>• 0=none<br>• 1=Signal and progression optimized streets<br>• 2=Divided and signal optimized<br>• 3=Continuous left-turn Lanes |
| Speed_Multiplier | Factor to multiply free flow speeds. Used for Smart Streets modeling. |
| Capacity_Multiplier | Factor to multiply capacity. Used for Smart Streets modeling. |
| County | Link County |
| City | Link City |
| RSA | Link RSA |
| Air_Basin | Link Air Basin |
| Sub_Air_Basin | Link Sub Air Basin |

| FIELD | DESCRIPTION |
|---|---|
| TAZ | Link TAZ |
| AB/BA_AreaType | Link Area Type |
| AB/BA_MedianSplit | Code to indicate median split in link |
| AB/BA_GradePercent | Grade Percent calculated from USGS |
| AB/BAGrade | Grade calculated from USGS |
| SCREENLINE | Screenline Number |
| MODE | Link Mode:<br>• 1=drive egress<br>• 2=highway<br>• 4=access to rail<br>• 24=rail<br>• 26=parking cost link<br>• 25=drive egress |
| TOLL_LINK | Flag field to indicate toll facility:<br>• Null=no toll<br>• 1=Toll |
| PostMile_ObjectID | ID field from Caltrans Postmile database |
| PostMile | Caltrans Postmile |
| PEMS_DIRECTION | Direction from PEMS Database |
| PEMS_ID | PEMS ID |
| WALKTIME | Link walk time |
| AB/BA_<PK/OP/PM>TIME | Peak, offpeak, and PM pre-calculated congested travel time |
| AB/BA_<AM/PM/MD/EVE/NT>_HOV_Penalty | Link time penalty assigned to HOV entrance links, otherwise zero |
| AB/BA_<AM/PM/MD>PARK | Flag field to indicate parking restriction on link by time period |
| AB/BA_<PK/OP>PARKCOST | Peak/Offpeak parking cost for link going into Urban Rail, Metrolink or HSR station |
| AB/BA_<PK/OP/PM>COST | Peak/Offpeak/PM pre-calculated congested cost |
| GRADE_<A/B/C/D/E/F/AVG> | Grade information from SCAG |
| WalkConnector | Flag field to define access/egress walk link for transit, calculated by Create Walk Connectors utility |
| AvgWalkTime | Average walk time from zone to stop, calculated by Create Walk Connectors utility |
| WalkTransfer | Flag field to define walk transfer link, calculated by Create Walk Connectors utility |
| TRUCK_GRADE | Truck grade calculated by the "Truck Length and Grade" Utility |
| TRUCK_LENGTH | Truck length calculated by the "Truck Length and Grade" Utility |
| PIVT | Walk time from station to station |
| PWALK | Walk time from parking lot to station |
| ParkSize | Station parking spaces |
| KIVT | Walk time from station to platform |
| KWalk | Walk time from KNR lot to station |
| AWalk | AWalk parameter for stations |
| BWalk | BWalk parameter for stations |
| StationPseudoZone | Internal station number used for mode choice model for nodes that are stations |
| StationName | Transit station name for mode choice |
| AB/BA_Toll_Entrance | Toll Link type: 31=Entering toll link, 32=Toll link, 33=Exiting toll link. Calculated in model from TOLLDATA TRANPLAN file |
| AB/BA TOLLV <AM/PM/MD/EVE/NT> <DA/SR2/SR3> | Toll values for type 32 links by time period, calculated from TOLLDATA file |
| AB/BA_<AM/MD/PM/EVE/NT>_PM_TOLL_TRK | Per-mile toll for each time period |

| FIELD | DESCRIPTION |
|---|---|
| AB/BA_<AM/MD/PM/EVE/NT>_FX_TOLL_TRK | Fixed toll for each time period |
| AB/BA TOLLV <AM/MD/PM/EVE/NT> TRK | Toll values for trucks by time period |
| VCTC_District | VCTC District Number<br>• 1=Ojai Area<br>• 2=Ventura Area<br>• 3=Oxnard Area<br>• 4=Port Hueneme Area<br>• 5=Santa Paula Area<br>• 6=Las Posas Area<br>• 7=Camarillo Carea<br>• 8=Fillmore Area<br>• 9=Moorpark Area<br>• 10=Thousand Oaks Area<br>• 11=Piru Area<br>• 12=Simi Valley Area<br>• 13=Oak Park Area<br>• 14=Ahmanson Ranch Area<br>• 100=Unincorporated Ventura County Area |
| VCTC_District2 | VCTC District Name |
| VCTC_TIMF | VCTC TIMF District Number<br>• 1=North County<br>• 2=Ventura<br>• 3=Oxnard<br>• 4=Central County<br>• 5=Camarillo<br>• 6=Thousand Oaks<br>• 7=Moorpark<br>• 8=Simi Valley |
| VCTC_TIMF2 | VCTC TIMF District Name |
| VCTC_City | VCTC City Name |
| Networks\Inputs\ 16r12by_routes.rts | |
| Route_ID | Route ID number internally generated by route editor |
| Route_Name | Unique route name assigned to route by user |
| TM_ID | Tripmaster Route ID |
| TM Name | Tripmaster Route Name |
| Carrier | Carrier ID |
| Carrier Name | Carrier Name |
| Line | Line ID |
| Pattern | pattern |
| Direction | direction |
| Mode_Desc | Mode description |
| Mode | Mode of route:<br>• 10=Commuter Rail<br>• 11=Local Bus<br>• 13=Urban Rail (MTA MetroRail)<br>• 14=Express Bus<br>• 21=High Speed Rail (only in future networks)<br>• 22=MTA Rapid Bus<br>• 30=Transitway<br>• 31=BRT |

| FIELD | DESCRIPTION |
|---|---|
| Long Name | Long Name of Route |
| Parent Route | Parent Route ID |
| Length | Calculated length of route |
| FARE_TYPE | 1=Flat Fare, 2=Zonal Fare |
| FARE_INDEX | Zonal Fare Matrix core number |
| BASE_CASH_FARE | One way adult cash fare |
| BASE_FARE_FACTOR | Factor to convert to average rider fare |
| AVG_FARE($2012) | Average ride fare in 2012 dollars |
| XFER_FARE | One way transfer fare |
| XFER_FARE_FACTOR | Factor to convert to average transfer fare |
| AVG_XFER_FARE($2012) | Average rider transfer fare in 2012 dollars |
| AVG_FARE | Average boarding fare |
| AVG_XFER_FARE | Average transfer fare |
| PK/OP_INIT_WAIT | Peak/Offpeak Initial Wait Time (calculated by model) |
| AM/MD/PM/EV/NT_freq | Frequency by time period (missing or zero indicates route not available during period) |
| AM/MD/PM/EV/NT_hdwy | Headway by time period (missing or zero indicates route not available during period) |
| PK/OP_Headway | Peak/Offpeak period headway (missing or zero indicates route not available during period) |
| AM/MD/PM/EV/NT_INIT_WAIT | Initial Wait Time by time period (calculated by model) |

**Table 3-4: VCTM Turn Penalty Dictionary**

| FIELD | DESCRIPTION |
|---|---|
| Networks\Inputs\ Turnpen.bin | |
| FROM_ID | The ID of the "from" link |
| TO_ID | The ID of the "to" link |
| PENALTY | Penalty value (in seconds) of the movement *Note: A value of 99999 is used for turn prohibitions* |

## 3.3 Trip Generation

Trip generation in the VCTM is a two-part process, which first converts land use to socio-economic data (SED) and then completes trip generation consistent with the 2016 SCAG model. **Table 3-5** summarizes the VCTM land use codes for model input. **Appendix B** includes a summary of existing year and future year SCAG land use codes, as well as the land use codes that are used in the VCTM.

It should be noted that the residential inputs into the VCTM land use tool are dwelling units, and not square footage of land use, therefore there are no residential land use types shown in **Table 3-5**.

**Table 3-5: Non-Residential Land Use Codes**

| LAND USE TYPE | UPDATED VCTM EXISTING AND FUTURE YEAR LAND USE CODE |
|---|---|
| General Office | 1210 General Office Use |
| Commercial and Services | 1200 Commercial and Services<br>1220 Retail Stores and Commercial Services<br>1221 Regional Shopping Center<br>1230 Other Commercial<br>1233 Hotels and Motels |

| LAND USE TYPE | UPDATED VCTM EXISTING AND FUTURE YEAR LAND USE CODE |
|---|---|
| Facilities | 1240 Public Facilities<br>1250 Special Use Facilities |
| Education | 1260 Education – K-12<br>1265 Education – College |
| Military Installations | 1270 Military Installations |
| Industrial | 1300 Industrial<br>1310 Light Industrial<br>1311 Light Manufacturing, Assembly, and Industrial Services<br>1320 Heavy Industrial<br>1321 Heavy Manufacturing<br>1340 Wholesaling and Warehousing |
| Transportation, Communications, and Utilities | 1410 Transportation<br>1420 Communication Facilities<br>1430 Utility Facilities |
| Mixed Commercial and Industrial | 1500 Mixed Commercial and Industrial |
| Mixed Residential and Commercial | 1600 Mixed Residential and Commercial |
| Open Space and Recreation | 1800 Open Space and Recreation |
| Vacant | 3000 Vacant |
| Agriculture | 2000 Agriculture |
| Undevelopable or Protected Land | 8888 Undevelopable or Protected Land |
| Unknown | 9999 Unknown |

A key input to the "Land Use to SED" module within the VCTM is land use conversion factors which converts non-residential square footages to number of employees. The land use to SED conversion module is developed in Excel format. It includes the square footage by land use type for each of the 663 TAZs within the VCTC area. Additional land use inputs required for each zone include the following attributes:

- **Group Quarters (Non-Institutional Population)** – Primarily comprised of students residing in dormitories, military personnel living in barracks, and individuals staying in homeless shelters. (Does not include persons living in institutions).
- **Number of K-12 Students** – The total number of K-12 students enrolled in all public and private schools.
- **Number of College Students** – The total number of students enrolled in any public or private post-secondary school (college or university) that grant an associate degree or higher, located within a zone.
- **A flag for Central Business District (Yes or No)**
- **A Fee for Daily Parking (in 2012 cents)**

The instructions for using the spreadsheet tool are as follows:

1. Determine if you want to use Land Use, Socioeconomic Data, or SCAG model inputs for each zone. This is accomplished using a pull-down tab for each of the zones included within the land use tool.
2. "Land Use" identifies that the user knows the number of dwelling units for the specific zone, as well as the square footage of non-residential land uses.
3. "Socioeconomic Data" identifies that the user has knowledge of the number of dwelling units, population, and total employment for the specific zone.
4. "SCAG Model Inputs" identifies that the user would prefer to use the SCAG model inputs directly.

5. Depending on the determination in Step 1, the user is then required to input either the square footage for each zone, or the known socioeconomic data. The spreadsheet is conditional formatted to black out cells where inputs are not required.
6. Apply a Floor Area Ratio (FAR) to each zone. The conversion factors were developed using data sets from SCAG for land use and final SED. The associated FAR is assumed to be 1.0 in the land use tool, and can be modified to achieve an employment value that differs from the value of employment if using the conversion rates directly. The default value for each of the zones is 1.0.
7. Apply Employment Category percentages. The socioeconomic model inputs for the VCTM model includes categories for 13 different types of employment. The user is required to adjust the percentages in the EMPLOYMENT tab of the spreadsheet if knowledge of employment is different than the assumed percentages obtained from SCAG.
8. Run the Land Use Model. Running the visual basic spreadsheet macros creates a .csv file that is used as direct model input.

The outputs from the Land use to SED tool is a comma delimited (.csv) file located in the \SED\ folder and is titled model_sed_subregion.csv. The model_sed_subregion.csv file (the output of the tool) includes zonal socioeconomic data for 71 attributes, summarized in **Table 3-6**.

**Table 3-6: Socioeconomic Data Dictionary**

| FIELD | DESCRIPTION |
|---|---|
| SED\Inputs\ model_sed_subregion.dbd | |
| TAZ Identifier Variables | |
| TAZ_TIER1 | Tier 1 zone structure from the SCAG Region |
| SubregionTAZ | Tier 3 zone structure from the SCAG Region |
| TAZ | TAZ Number |
| TAZ_ID | Alternate TAZ Number |
| INTERNAL_SEQUENCE_TAZ | Sequential zone number system |
| CNTY | County |
| PUMA5 | 5 digit PUMA number |
| DISTRICT | District Number |
| CBD | Central Business District flag |
| RSA | RSA Number |
| ZONETYPE | "Internal", "External", "Airport", or "Seaport" |
| CALIBRATION_FACTOR | SCAG calibration factor |
| POP | Population |
| RES | Resident Population |
| GN | Group Quarters Population |
| AGE<5_17/18_24/16_64/65_OVER> | Population by age bracket |
| HH | Households |
| SFDU | Single Family Dwelling Units |
| MFDU | Multi-Family Dwelling Units |
| HHSIZE<1/2/3/4> | 1/2/3/4+ Person Households |
| HO<18_24/25_44/45_64/65_OVER> | Head of Household Age 18-24/25-44/45-64/65 and over |
| HH_WRK<0/1/2/3> | Households with 0/1/2/3+ workers |
| <LINC/MINC/HINC/VHINC>_HH | Households with income group <$35,000/$35,000-$75,000//$75,000-$150,000/>$150,000 |
| K12 | Kindergarten – 12th grade enrollment |
| COLLEGE | College enrollment |
| <LINC/MINC/HINC>_WRK | Low/Medium/High Income Workers |

| FIELD | DESCRIPTION |
|---|---|
| SED\Inputs\ model_sed_subregion.dbd | |
| TAZ Identifier Variables | |
| MEDIAN | Median Income |
| MEDIAN<35K/35_75/75_150/_150> | Median Income in < $35,000/$35,000-$75,000/$75,000-$150,000/>$150,000 income group |
| TOT_EMP | Total Employment |
| TOT<LOW/MED/HIGH>_EMP | Total low/medium/high employment |
| <AG/CONST/MANU/WHOLE/RET/TRANS / INFOR/FIRE/PROF/EDUC/ARTENT/ OTHERSER/PUBADMIN>_EMP | Agricultural/Construction/Manufacturing/Wholesale/Retail/Transportation/Information services/Financial-Real Estate/Professional/Educational/Arts-Entertainment/Other Services/Public Administration employment |
| DAILYPARK | Daily parking cost |
| PERCENT_<25/50>_BUS | Percent of TAZ within a quarter/half mile of bus station |
| PERCENT_<25/50>_RAIL | Percent of TAZ within a quarter/half mile of rail station |

## 3.4 Traffic Assignment

The VCTM model uses the same methodologies as the SCAG model for trip assignments. A static, multiclass user equilibrium assignment is utilized for the highway network. The highway assignment concurrently loads the vehicles forecasted by the mode choice model, the internal-external and external-external vehicle trips, and the three classes of heavy duty trucks (light, medium and heavy). The OD trip tables loaded to the highway network include the following vehicle classes:

- Drive Alone
- Shared Ride 2 No HOV
- Shared Ride 3+ No HOV
- Shared Ride 2 HOV
- Shared Ride 3+ HOV
- Light Trucks
- Medium Trucks
- Heavy Trucks

The highway assignment produces traffic volumes, congested speeds, vehicle-miles traveled (VMT), and vehicle-hours traveled (VHT), for each of the five time periods. The VCTM model assigns, or loads, vehicle trips into the following five time periods, just as the SCAG model does:

- AM Peak (AM) – 6:00 AM to 9:00 AM,
- Midday (MD) – 9:00 AM to 3:00 PM,
- PM Peak (PM) – 3:00 PM to 7:00 PM,
- Evening (EV) – 7:00 PM to 9:00 PM, and
- Night (NT) – 9:00 PM to 6:00 AM.

The summation of the assignments by time period produce average daily traffic volumes (ADT) for the model network. Passenger-car equivalent conversions are completed for truck volumes for each link. A travel time loop feedback procedure achieves convergence between the highway assignment and the demand model. A

relative gap of 0.001 or 200 iterations, whichever occurs first, determines convergence for each assignment process. **Table 3-7** summarizes assignment output attributes.

**Table 3-7: Assignment Output Data Dictionary**

| FIELD | DESCRIPTION |
|---|---|
| Assign\Outputs\ <AM/MD/PM/EVE/NT>_flow.bin | |
| <AB/BA/Tot>_Flow_PCE | PCE-weighted total flow |
| <AB/BA/Max>_Time | Congested travel time |
| <AB/BA/Max>_VOC | Volume-to-Capacity ratio |
| <AB/BA/Tot>_V_Dist_T | Link Vehicle Miles Traveled |
| <AB/BA>_VHT | Vehicle Hours Traveled |
| <AB/BA>_Speed | Congested Speed |
| <AB/BA/Max>_VDF | Congested total cost |
| <AB/BA>_Flow_<DA/SR2 HOV/SR3 HOV/LHDT/MHDT/HHDT/SR2 NONHOV/SR3 NONHOV> | Link flow by vehicle class |
| <AB/BA/Tot>_Flow | Raw Vehicle flow without the PCE weights |
| <AB/BA>_Flow_Transit | Calculated fixed transit flow |
| <AB/BA>_Flow_Transit_Preload | Calculate fixed transit preload flow |
| <AB/BA>_Flow_<LIGHT TRUCKS/ MEDIUM TRUCKS/HEAVY TRUCKS> | Light, Medium, Heavy truck flow |
| <AB/BA>_<Light_Truck/Medium_Truck/Heavy_Truck>_PCE | Light, Medium, Heavy truck PCE flow |
| Total Delay | Total Flow * (Congested time – Free Flow Time) |
| Assign\Outputs\ <AM/MD/PM/EVE/NT>_Turns.bin | |
| VOLUME | From link to link turning movement loaded volume |
| VOLUME_<DA/SR2 HOV/SR3 HOV/LHDT/MHDT/HHDT/SR2 NONHOV/SR3 NONHOV> | From link to link turning movement loaded volume by vehicle class |

## 3.5 Select Link Model Run

The VCTM model is capable of performing select link runs. If the "selectlink.qry" file exists in the Assign\Inputs directory, the model will perform select link analysis during the assignment process which will add fields to the assignment flow output tables that represent the query flows. Select link query matrices will be generated in the Assign/Outputs directory.

To enable a select link run, open the 'selectLink.qry' file using a text editor software and modify the name and link ID in the code to replicate the following:

```
<?xml version="1.0"?>
<critical_link_queries>
<query>
<name>"YOUR SEGMENT NAME"</name>
<text>
Link("LINK ID NUMBER")
</text>
</query>
</critical_link_queries>
```

To run select link analysis for multiple links, the 'query' section (lines 3 through 8 above) needs to be repeated for each additional link. After running the assignments, volumes on the selected links can be found in assignment output flow files for each time period.

## 3.6 Model Evaluation

A post-processing script was added to the VCTM to combine regularly used model outputs into .dbf format for use in spreadsheet analysis, as well as standardized model plots for use in model verification and ease of review.

### 3.6.1 Database Files

Standard database (.DBF) files are automatically created and saved in the Analysis\dbf folder for each assignment. These .DBF files are used in the automated spreadsheet analysis files as discussed in *Section 3.6.4* of this report. The .DBF files created are the following:

- HWY_LINKS.DBF
- HWY_LOADS.DBF
- HWY_LOS.DBF
- HWY_NODES.DBF
- HWY_VMTVHTVHD.DBF
- TOT_SCREENLINE<#>.DBF

**Table 3-8** summarizes multiple .DBF output file attributes.

**Table 3-8: Analysis Output DBF Data Dictionary**

| FIELD | DESCRIPTION |
|---|---|
| Analysis\DBF\ HWY_LINKS.DBF | |
| AB/BA_PSPEED | Posted speed |
| AB/BA_FFTIME | Calculated free-flow travel time |
| AB/BA_<AM/MD/PM/EVE/NT>LANE | Number of lanes by time period |
| AB/BA_CAPA<AM/MD/PM/EVE/NT/D> | Total capacity by time period |
| Analysis\DBF\ HWY_LOADS.DBF | |
| <AM/MD/PM/EVE/NT>TIME<AB/BA> | Loaded link travel time by time period |
| <AM/MD/PM/EV/NT/D>VOL<AB/BA> | Loaded link volume by time period |
| <AM/MD/PM/EV/NT/D>DAVOL<AB/BA> | Loaded link volume for DA vehicles by time period |
| <AM/MD/PM/EV/NT/D>SR2VOL<AB/BA> | Loaded link volume for SR2 vehicles by time period |
| <AM/MD/PM/EV/NT/D>SR3VOL<AB/BA> | Loaded link volume for SR3 vehicles by time period |
| <AM/MD/PM/EV/NT/D>LTKVOL<AB/BA> | Loaded link volume for Light Truck vehicles by time period |
| <AM/MD/PM/EV/NT/D>MTKVOL<AB/BA> | Loaded link volume for Medium Truck vehicles by time period |
| <AM/MD/PM/EV/NT/D>HTKVOL<AB/BA> | Loaded link volume for Heavy Truck vehicles by time period |
| <AM/MD/PM/EV/NT/D>TKVOL<AB/BA> | Loaded link volume for All Trucks vehicles by time period |
| <AM/MD/PM/EV/NT/D>TRVOL<AB/BA> | Loaded link volume for Transit vehicles by time period |
| Analysis\DBF\ HWY_LOS.DBF | |
| <AM/MD/PM/EV/NT/D>VOC<AB/BA> | Directional volume over capacity ratio by time period |
| <AM/MD/PM/EV/NT/D>VOC | Total volume over capacity ratio by time period |
| Analysis\DBF\ HWY_NODES.DBF | |

| FIELD | DESCRIPTION |
|---|---|
| Analysis\DBF\ HWY_LINKS.DBF | |
| VCTC_INT | Flagged field in nodes input layer identifying an intersection number (user defined) |
| TURNS | Flagged field in nodes input layer to report turning movements at node<br>• 1=Yes |
| Analysis\DBF\ HWY_VMTVHTVHD.DBF | |
| <AM/MD/PM/EV/NT/D>VMT<AB/BA> | Vehicle-Miles Traveled by time period |
| <AM/MD/PM/EV/NT/D>VHT<AB/BA> | Vehicle-Hours Traveled by time period |
| <AM/MD/PM/EV/NT/D>VHD<AB/BA> | Vehicle-Hours of Delay by time period |
| Analysis\DBF\ TOT_SCREENLINE<#>.DBF | |
| <AB/BA/TOT>CAP | Directional/Total link capacity |
| <AB/BA/TOT>VOL | Directional, loaded link volume |
| <AB/BA>COUNTID | Directional count location ID |
| <AB/BA>FTYPE | Directional link facility type |

### 3.6.2 Vehicle OD

Standard comma delimited (.CSV) and matrix (.MTX) files are automatically created and saved in the Analysis\VehicleOD folder for each assignment. These files are used in the automated spreadsheet analysis file titled VehicleOD.xlsm, as discussed in *Section 3.6.4* of this report. The files created are the following:

- <AM/MD/PM/EVE/NT/DAY>_<CITY/DISTRICT/REGION/TIMFDISTRICT>_TRIP.MTX
- <AM/MD/PM/EVE/NT/DAY>_<CITY/DISTRICT/REGION/TIMFDISTRICT>_TRIP.CSV

The .CSV files are direct matrix exports of the .MTX files.

### 3.6.3 Plots

Standard map (.MAP) files are automatically created and saved in the Analysis\Plots folder for each assignment. These maps automatically zoom, color-code, and label various fields of concern for model verification. The maps created are the following:

- _FunctionalClassification_Number of Lanes.MAP
- _FunctionalClassification-Posted Speed.MAP
- _VCRatioFlow_<AM/MD/PM/EVE/NT/DAY>.MAP

### 3.6.4 Spreadsheets

Standard macro-enabled excel (.XLSM) files are stored in the Analysis\XLS folder, and are automatically saved and dated in the Analysis directory after processing. To run these files, the user needs to open each .XLSM file independently and run the macros using the built-in buttons on the spreadsheet. The .XLSM files available to process automated outputs are the following:

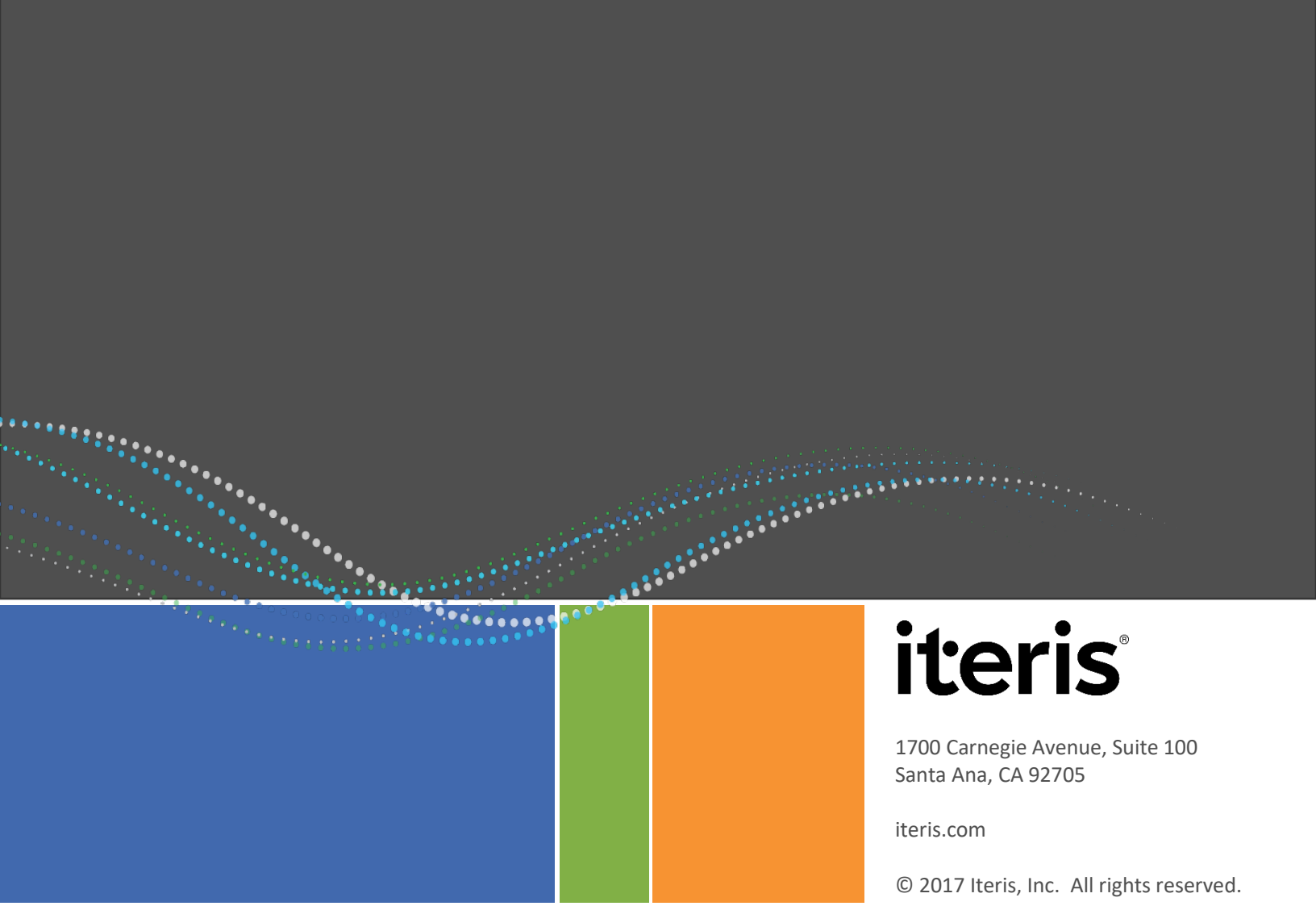
- **COUNTVOLUMECOMPARE.XLSM:** Used primarily for base year validation, and creates outputs specifically related to FHWA and Caltrans validation criteria for count/volume comparisons, including percent difference by functional classification, %RMSE, $R^2$, and % of links within Caltrans standard deviations.
- **SCREENLINES. XLSM:** Used primarily for base year validation, and creates outputs specifically related to screenline analysis using FHWA and Caltrans screenline validation criteria. Tables and charts are

automatically created for ease of analysis and comparison between alternatives.

- **VehicleOD.XLSM:** Used for air-quality analysis, this spreadsheet creates zonal-based matrices of VMT data for different geographical combinations, including regional, district to district, TIMF district to TIMF district, and City to City. Outputs are created for each time of day.
- **VMT_VHT_VHD.XSM:** Used for regional analysis and air-quality analysis, this spreadsheet calculates link-based VMT, VHT, and VHD statistics as well as speed-bin classified VMT data for air quality analysis. All data is summarized by each time of day, and also summarized by the region, districts, TIMF districts, and Cities.

# APPENDIX A – SCAG USER GUIDE

# APPENDIX B – LAND USE



iteris®

1700 Carnegie Avenue, Suite 100
Santa Ana, CA 92705

iteris.com



Innovating Through Informatics™