Shasta Regional Transportation Agency (SRTA)
Activity-Based Travel Demand Model (ShastaSIM v1.1)
Model Users Guide
June 2015

DKS

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1. SHASTASIM INTRODUCTION

The Shasta Regional Transportation Agency (SRTA), as the designated Metropolitan Planning Organization (MPO) for Shasta County, has primary responsibility for the development and maintenance of travel demand forecasting methods and models for the region. SRTA teamed with DKS Associates, John Bowman, Mark Bradley, and Resource Systems Group Inc. (RSG) to develop a new activity-based (AB) travel demand model, henceforth referred to as ShastaSIM, for the Shasta County region. This document is the model user guide, which provides step-by-step instructions for application of the ShastaSIM model. The *ShastaSIM Model Development Report*, which describes the model in detail, is a separate document that is included with the ShastaSIM CD and can be found on SRTA's website at http://www.srta.ca.gov/174/Travel-Demand-Modeling.

ShastaSIM Software Requirements

The ShastaSIM model is an Activity Based (AB) model built using a combination of software packages. The following software packages are required for utilizing the ShastaSIM model:

- CUBE Base/Voyager 6.1 or 6.4 (Citilabs)
- DAYSIM08 (Bowman and Bradley)
- Excel 2010 or later (Microsoft)

DAYSIM08 is included with the ShastaSIM model package users receive. It is assumed that users have their own copy of Citilabs' CUBE Base/Voyager and Microsoft Excel software. Other software packages, such as ArcMap (ESRI) and utilities such as text editors can also be useful for working with GIS (geographic information systems) and text files. Minimum and recommended hardware requirements have been identified in the *ShastaSIM Model Development Report, and are as follows:*

- Intel Core 2 Duo
- 4GB of RAM
- 15GB of hard drive space
- 32-bit Operating system
- **Windows Vista/7/8**

SRTA currently runs the model using the following computer system†:

- Dell Precison T5600
- Intel® Xeon® CPU E5-2643 0 @ 3.30 GHz (2 processors)
- 32GB of RAM
- 64-bit Operating System
- Windows 7

†Model run times average 4 hours per model year with SRTA's current setup.

Best Practices

Throughout this document users will find various recommended "best practices." These are identified by ***bold and italic, light blue*** text. While most are only recommended actions users should take, they are provided – based on experience developing and using ShastaSIM – to help make modeling and analysis of results easier for the user. Users should consider some "best practices" as 'shall do this' or 'shall not do this' statements, either due to their impact on later steps in the modeling process or model applications. Users will find these as ***bold and italic, dark-red*** text and generally additional comments will be provided to provide reasoning or explanation.

2. ShastaSIM User Interface and Structure

CUBE GUI

The basic GUI (graphical user interface) of Citilabs' CUBE software is depicted in **Figure 1**. The figure depicts the major elements of the GUI. At the top of the GUI is the **RIBBON**, an element common to programs developed for use in the Windows 7 and 8 environments. The ribbon is context sensitive and its buttons change depending on the tab selected. Tabs available are depending on the file type open (application, network, script, etc.). To the left are three main sections – the **SCENARIO PANE, APPLICATION PANE** and **APPLICATIONS KEYS PANE**.

The **SCENARIO PANE** shows a "tree" of all scenarios contained in the model. Scenarios can be added (which adds a new directory on the computer), deleted (which deletes the corresponding directory on the computer), or renamed (which renames the corresponding directory on the computer). For the ShastaSIM model, all scenarios are "children" to the "Base" scenario, and alternatives to a specific year should be added as "children" to that year. Scenarios can be added, deleted, or renamed by right clicking on the appropriate scenario or "parent" scenario. A "child" scenario will inherit key values from its parent. For example, if a new scenario called "AltA" was created as a child of the "SH25" scenario, the keys for the new "Alt A" scenario initially would have the same values as the "SH25" scenario. The keys should be modified to reflect the correct inputs for the new model run. More details are available in Chapter 4 - Model Scenarios.

The **APPLICATION PANE** shows all of the applications and sub-applications contained in the model for each respective catalog (.cat) file. For ShastaSIM, it shows the six main applications, including Buffer and Pop (buffering and population synthesizer), FBLOOP (feedback loops of numerous sub-applications), TRANSASN (transit assignment), PEAKHOUR (peak hour assignments), and DAILY (combining all assignments into one daily network). Double clicking on any application will open it.

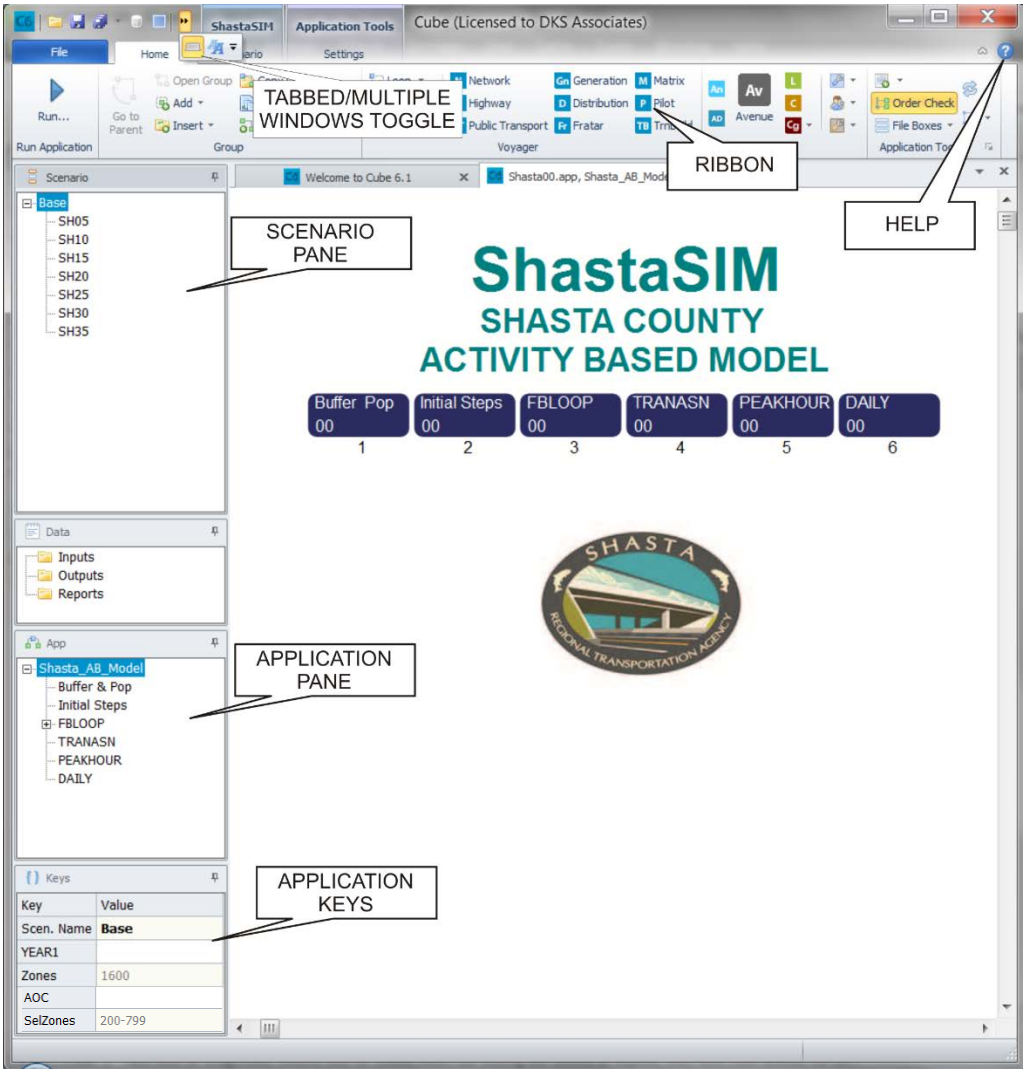
The **APPLICATION KEYS PANE** shows a list of "keys" which are text fields dependent on the scenario selected. Keys may represent input and output file names, directory names, numbers, character strings or Boolean flags. More information regarding keys, including how to edit, rename, delete or load keys can be found in Chapter 15 of Citilabs' CUBE Base Model Reference Guide. ***Two additional keys have been added to the Application Keys Pane called AOC and SelZones, starting with ShastaSIM v1.1 (2015). Information on these new keys is available at the end of Chapter 3.***

The **MAP/ APPLICATIONS WINDOW** shows, visually, the data file currently open. This window can visually display many types of files including applications (flow chart style), networks

(maps), and scripts (text). Multiple files can be open at the same time and the software has two options for having multiple files open. The tabbed option (as depicted in **Figure 1**) has a series of tabs at the top of the window and users can cycle between the tabs. The multi-document view allows the user to see multiple files at the same time and windows can be tiled (vertically or horizontally), cascaded, or synchronized (network maps only). Synchronized views are perfect for comparing "parent" and "child" scenario results at specific locations. These two modes can be toggled in the top menu as shown in **Figure 1**.

It should be noted that this document contains only basic instructions for using CUBE as it relates to the ShastaSIM model. It is not a comprehensive manual on how to use CUBE. More details on using CUBE can be found within the software's **help** feature.

Figure 1: ShastaSIM CUBE Graphical User Interface



Directory and File Structure

Throughout this document, files that reside on the user's hard drive (either input files or output files) are displayed in **BOLD DARK BLUE** text.

ShastaSIM requires a particular file structure to function properly. While the entire CUBE "Catalog" (**SHASTASIM.CAT**) can be located anywhere on a user's hard drive, ***the file structure within the catalog directory must be fixed for the model to operate properly.*** If the directory containing ShastaSIM is copied onto a new computer, the first time it is opened, CUBE asks the user if it is okay to rename all of the directory references in all scripts. This allows for sharing of the model and its files between computers. The "catalog directory" is the directory in which the ShastaSIM.cat file (and other catalogs) is located. Within this catalog directory, the required file structure is as follows:

- **SHASTASIM**
  - **APPLICATIONS**
    - AB_MODEL
      - DAILY
      - FBLOOP
      - INITIAL
      - PEAKHOUR
      - TRANSASN
    - INPUTS
    - OUTPUTS
    - TRANSIT
  - **BASE**
    - SH05
    - SH10
    - SH13
    - SH15
    - SH20
    - SH25
    - SH30
    - SH35
  - **COMMON_START_FILES**
    - SH05
    - SH10
    - SH13

- SH15
- SH20
- SH25
- SH30
- SH35

- **COMPARE**
  - LU
  - NETWORKS
  - OUTPUTS
    - DELTA
    - LOS
    - VMT
    - VOLUME
  - PARCEL
  - TRANSIT
- **CREATE PARCELS**
- **GIS**

In the above file structure, the **APPLICATIONS** directory and its subdirectories contain all of the CUBE Application Manager applications (*.APP) and associated scripts (*.S) as well as many of the print files (*.PRN) generated by the model. The **BASE** directory and its subdirectories contain the actual model runs and results files. The **COMPARE** directory and its subdirectories contain scenario comparison output files that will be discussed later (chapter 8) in this document. The **GIS** directory contains geographic information systems (GIS) files for use as backgrounds in CUBE mapping.

In order for a specific scenario to be run, the following 25 files must be in the scenario directory:

Files consistent between all model runs (located in COMMON_START_FILES directory):

1. **PUMS_SHAS_ACS08_12.DBF**
2. **INTERSECTIONS.DBF**
3. **OPEN_SPACE.DBF**
4. **CELPREDFILETEMPLATE.DBF**
5. **COEFFS13.TXT**
6. **EOUTTEMPLATE.DBF**
7. **HWFLOWDISTTEMPLATE.DBF**
8. **HWFLOWRADTEMPLATE.DBF**
9. **PFILETEMPLATE.DBF**
10. **SAMPFTEMPLATE.DBF**

11. SFILETEMPLATE.DBF
12. SHADFILETEMPLATE.DBF
13. TFILETEMPLATE.DBF
14. COUNTS2010.DBF
15. SACFFTPP.TXT

Files typically the same for all scenarios of a specific year (located in COMMON_START_FILES\SHxx):

16. 20XX_IXXI.DBF
17. 20XX_TAZ.DBF
18. 20XX_XXMAT.DBF

Files that may change between scenarios:

19. TURN.PEN
20. BASE.SUP
21. 20XX_PNR.DBF

Files that typically do change between scenarios:

22. 20XXBASE.NET
23. PARCEL_UPDATE_ALLOCHH.CSV
24. BASE.LIN
25. TURNNODES.S

The first 15 of these files are consistent between all runs (they do not depend on forecast year) and can simply be copied from one scenario directory to another. The next three (16-18) are typically the same for all runs of a specific year ***and can be copied from the "parent" scenario to the "child" scenario of a particular year.***

The next three (19-21) may change if transit or roadway network changes are assumed; although they are not likely to change. File 19 can be modified if the user wants to add turn prohibitions to the model. The file format is:

A B C 1 -1

Where **A** is the "from" node, **B** is the "through" node, and **C** is the "to" node. These three nodes are followed by a **1** and a **-1**. Currently all numbers are separated by two spaces. One row should exist for each prohibited movement at an intersection. Therefore there can be more than one row per intersection.

Files 20 and 21 are only likely to change if the user desires to modify the details of park-and ride access or transfer access between transit lines or modes.

The next three files (22-24) are the most likely to change, as most scenario changes are typically

based on land use, roadway network, or transit modifications. The modification of these last three files will be discussed **chapters 4-6** in this document.

The final file (25) allows the user to select which nodes (or intersections) are selected for extracting peak hour turning movement volumes. The file must begin with "turns n=" and contain a list of nodes separated by commas. It can be a blank file if the user does not want to extract any turn movement volumes.

One additional file that should be located in the scenario directory (but is not required for a successful run) is the **DEFAULT.VPR** file. This file results in all input and output networks being opened in the scenario directory having similar color schemes and saved zoom windows.

Catalog Files

ShastaSIM includes four distinct catalog (.cat) files in order to run the model. They are:

- **ShastaSIM.CAT** – Primary catalog file to run model scenarios.
- **ShastaSIM_COMPARE_INPUTS.CAT** – Evaluates and compares model inputs between two scenarios. ***Typically users choose the "parent" scenario (SHxx) and "child scenario" for the same model run year.***
- **ShastSIM_COMPARE_OUTPUTS.CAT** – Evaluates and compares model outputs between two scenarios. ***Typically users choose the "parent" scenario (SHxx) and "child scenario" for the same model run year.***
- **ShastaSIM_COMPARE_TRANSIT.CAT** – Evaluates transit assignment, transit boardings, and the number of jobs (employment) and households within ¼ and ½ mile of the transit system.

See chapter 3 for more details on **ShastaSIM.CAT**. See chapter 8 for more details for all three "compare" catalogs.

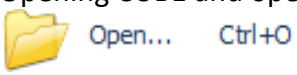
3. RUNNING SHASTASIM

Like the Shasta County four step model before it, ShastaSIM runs in the CUBE Application Manager environment. After a new scenario has been created, as described in chapter 4, all necessary files copied over to the new directory, and the necessary files edited (roadway network, transit lines, and land use), the scenario can be run using the ShastaSIM application in Cube. ***Note: New keys were added to ShastaSIM v1.1. Before running any of the following steps, see the Auto Operating Cost and Select Zone Keys section at the end of this chapter.***

Running a Scenario

In order to run a scenario, conduct the following steps:

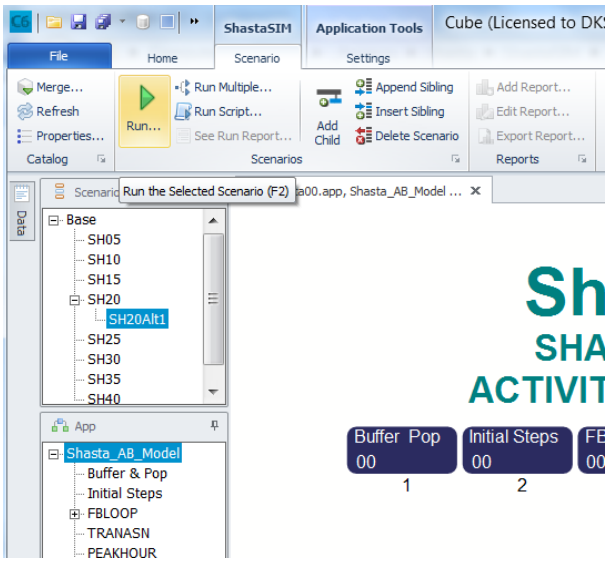
1. Open **SHASTASIM.CAT** by either:
   a. Double clicking on the file in the Catalog Directory
      

      , or;
   b. Opening CUBE and opening the catalog file from within CUBE
      

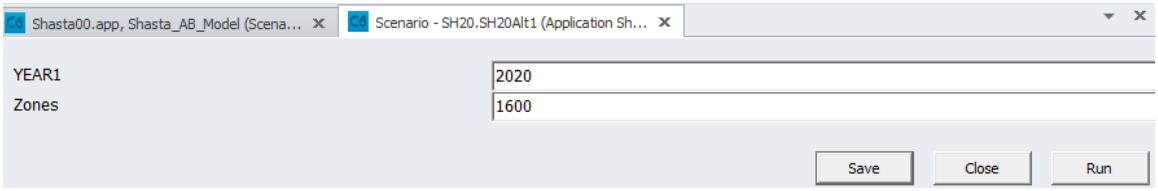
      If the scenario pane on the left is too small to see all scenarios, it can be stretched.

2. There are multiple ways to begin a single model run or series of model runs from within CUBE.
   a. **Method 1**: With ShastaSIM.cat open and the SCENARIO tab selected on the Ribbon (see **Figure 2** below).

Figure 2: Run Model Using Scenario Ribbon

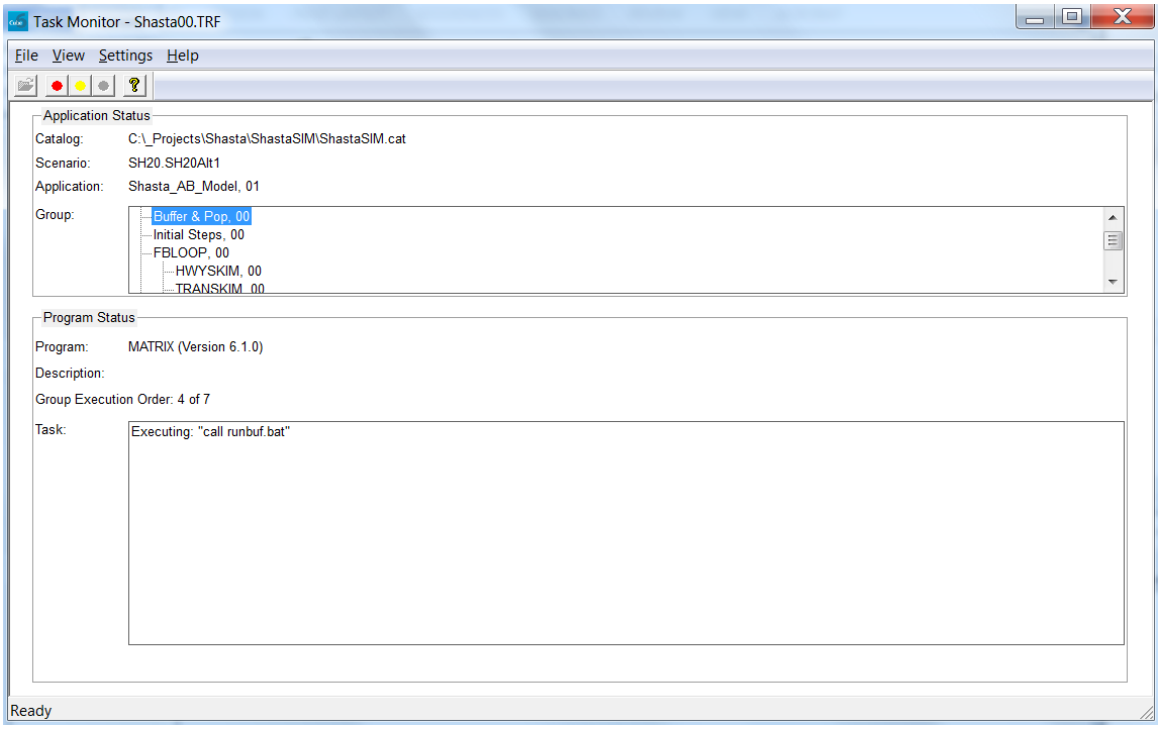


i. Click Run…
ii. The following window will open:



iii. Make sure the correct year is shown in YEAR1 and click Run.
iv. The single scenario will begin running and a Task Monitor window will open.

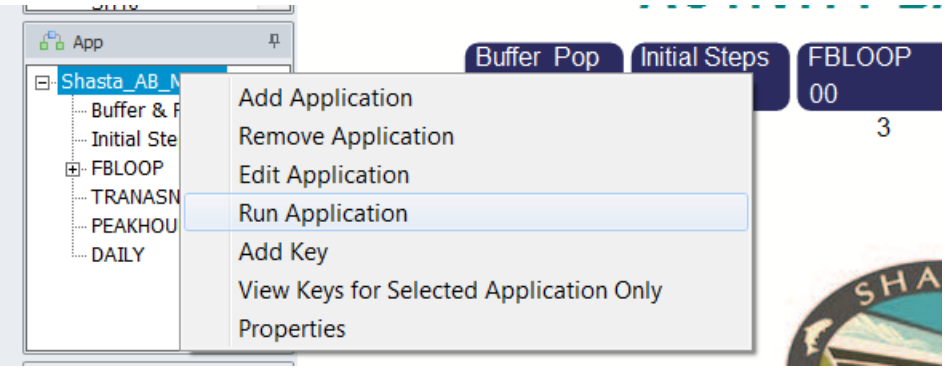
Figure 3: Task Monitor Window



v. In order to run multiple scenarios using method 1 (one after the other, typically overnight) click Run Multiple… . The Run Catalog window will open.
vi. Multiple runs can be added to the selected list and clicking OK will run all of the selected scenarios one after the other. ***It should be noted that scenarios will run in sequence, not at the same time.***

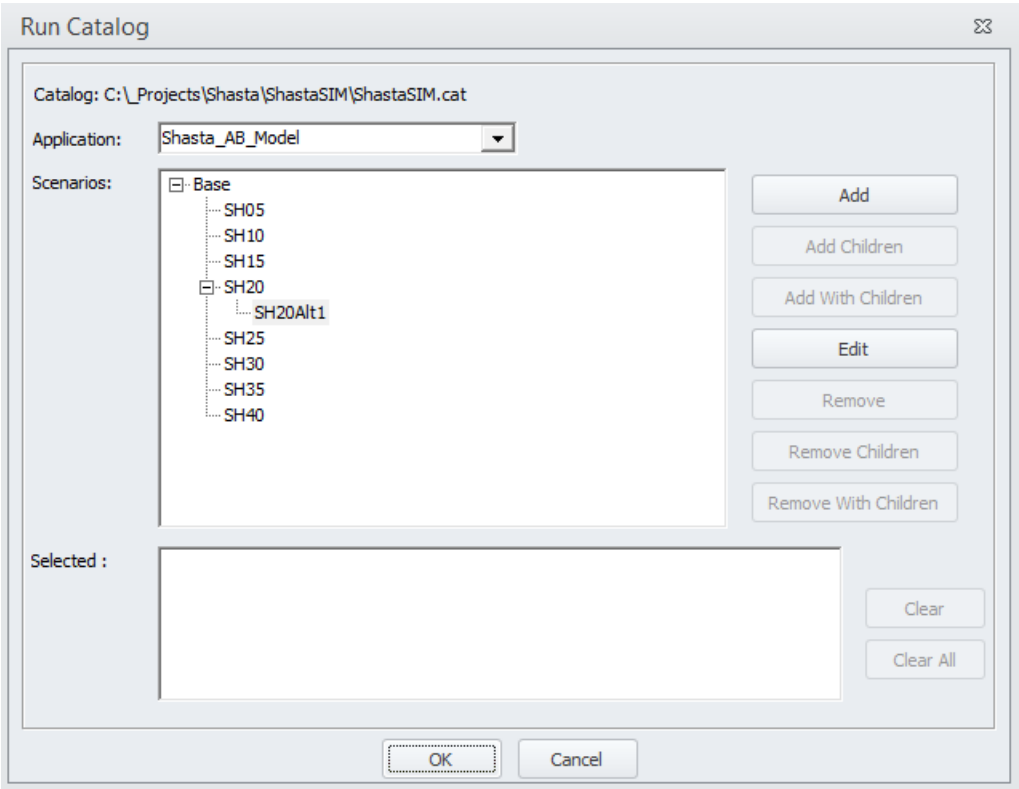
b. **Method 2**: With ShastaSIM open in CUBE, right-click on **Shasta_AB_Model** in the Applications Pane and select Run Application from the drop-down menu (see **Figure 4**)

Figure 4: Run Model from Scenario Pane



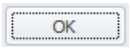
i. The Run Catalog window will open.

Figure 5: Run Catalog Window



ii. If any undesired scenarios appear in the **Selected:** box, click **Clear All** to remove them.

iii. Click on the desired scenario (or multiple scenarios) in the **Scenarios:** box and click **Add** to add it to the **Selected**: box.

iv. Click 

to begin the run. Just like Method 1 above, the single (or first of multiple) scenario will begin running and a Task Monitor window will open.

3. Depending on computer hardware, each run will take anywhere between three to six hours.
4. The model will run all six sub-models, which includes generating the synthesized population and associated daily travel tours, as well as peak and daily vehicle assignments.
5. Key output files to be used for future MOE calculations and scenario comparisons include the following files below:

- **TOUT1.DBF**: Tour day-level output file
- **SOUT1.DBF**: Trip day-level output file
- **POUT1.DBF**: Person day-level output file
- **20xxA3VO.NET**: AM period loaded network
- **20xxMDVO.NET**: Midday period loaded network
- **20xxP3VO.NET**: PM period loaded network
- **20xxEVVO.NET:** Evening period loaded network
- **20xxA1VO.NET**: AM peak hour loaded network
- **20xxP1VO.NET**: PM peak hour loaded network
- **20xxA1P1.NET**: AM/PM peak hour validation
- **20xx DAYSUM.NET**: Daily loaded network/ validation
- **20xxAMTRN.DBF:** Selected AM peak hour turn movement volumes
- **20xxPMTRN.DBF:** Selected PM peak hour turn movement volumes

Details of the contents of these files can be found in the *ShastaSIM Model Development Report*. That document is included with the ShastaSIM CD and can be found on SRTA's website at http://www.srta.ca.gov/174/Travel-Demand-Modeling.

Auto Operating Cost (AOC) and Select Zone (SelZone) Keys

Two new keys have been added, starting with ShastaSIM v1.1 (2015), to the Application Keys Pane called AOC and SelZones.

AOC represents the auto operating (ownership) cost for the given year. ***The AOC key should only be modified by SRTA staff. Modifications to this key may render the results inconsistent with the adopted Regional Transportation Plan and Sustainable Community Strategy for the region.***

The SelZones key performs "select zone" analysis whereby trips to and from the selected zone or zones are tracked in a separate volume field in the output loaded networks. A single zone can be identified (e.g. 260), or a range of zones (e.g. 260-265), or a series of zones (e.g. 260,263,265). A series of ranges can also be identified (e.g. 200-265,270-275). A volume field with the letter "Z" denotes the volumes to and from the selected zones.

Values for the SelZone key should only include zone numbers, dashes (-), or commas (,). The model now automatically performs a select zone analysis for at least one zone and the user should make sure the SelZones key contains at least one zone number.

4. Model Scenarios

As with the previous four step model, scenarios have been developed for five year increments. "Base" scenarios have been developed and run for the years 2005, 2010, 2013*, 2015, 2020, 2025, 2030, and 2035.

**The 2013 scenario year (SH13) is included because it was a base year for environmental analysis for SRTA's 2015 Regional Transportation Plan, with Sustainable Communities Strategy.*

The most common scenarios the model may be used for are:

1. Making transportation network changes and evaluating results;
2. Making transit network changes and evaluating results;
3. Making land use changes and evaluating the results; and
4. Any combination of the above.

Below we discuss these common scenarios and describe which of the 25 model files (discussed in chapter 2) the model user would typically modify.

The following rules should be observed when creating scenarios in ShastaSIM:

- ***"Base" or "Parent" scenarios should never be edited.***
- Scenarios have to be added to the ShastaSIM catalog, as well as all three COMPARE catalogs. Users will need to manually add the appropriate "child" scenario under each "parent" scenario for each catalog.
- Ensure that the scenario name, description, keys, etc. are the same as those in the ShastaSIM catalog. Be careful to check spelling on scenario names, as slightly different spelling between catalogs will result in scenarios not working correctly.
- Scenario names should be descriptive yet simple.

Create New Scenario and Populate Directory

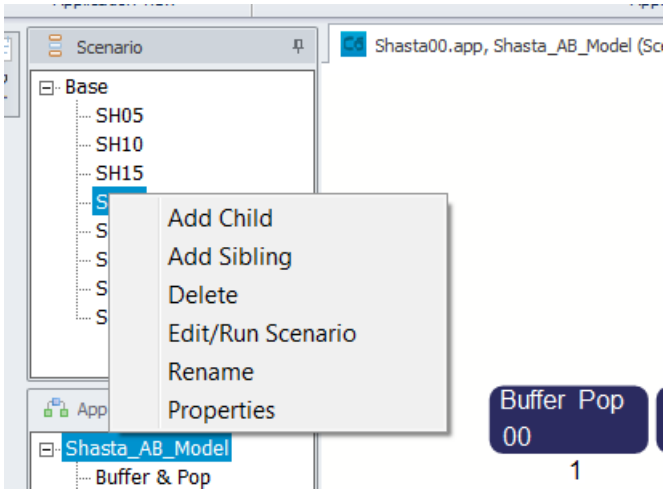
In order to create a new scenario, conduct the following steps:

1. Open **ShastaSIM.cat** by either:
   a. Double clicking on the file in the Catalog Directory

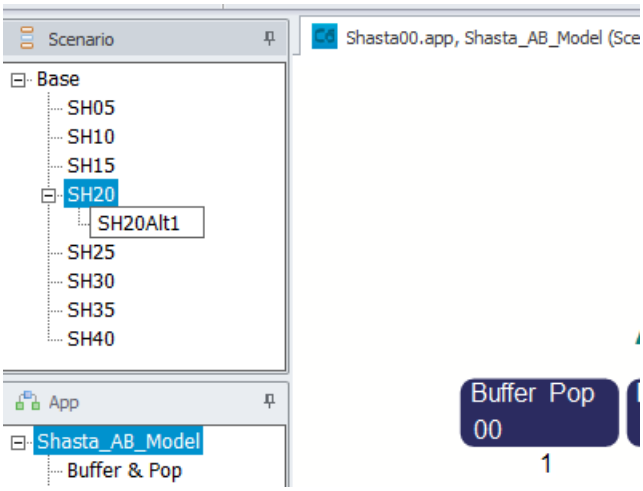
      
      ShastaSIM.cat, or
   b. Opening CUBE and opening the catalog file from within CUBE

      
      Open... Ctrl+O

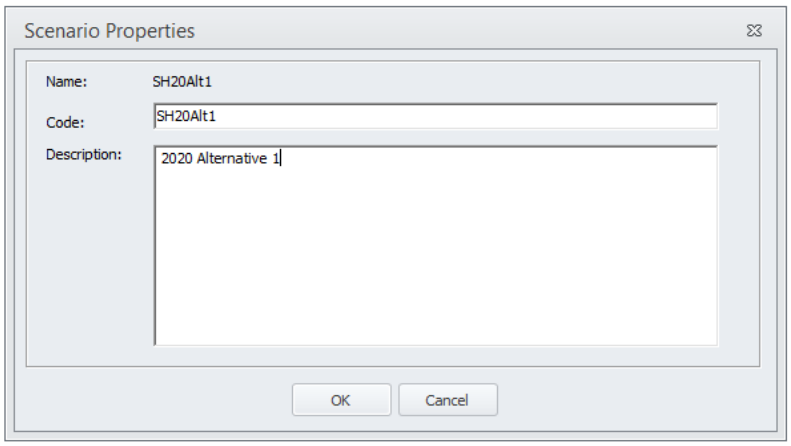
      If the scenario pane on the left is too small to see all scenarios, it can be stretched.
2. Right click on the year for the new scenario (for example SH20) and click "Add Child".



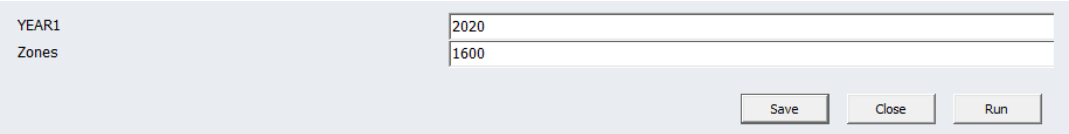
3. Give the scenario a simple, but descriptive name (for example SH20Alt1) and hit return.



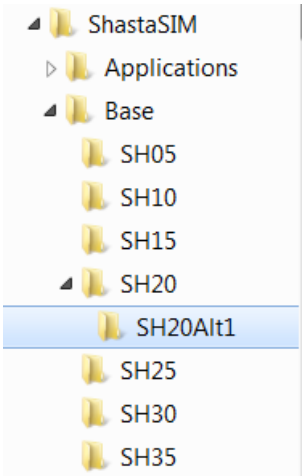
4. The "Scenario Properties" dialog box will appear.



5. Next to "Code:" input the same scenario name as above. ***A description can be entered in the appropriate box, but it is optional.***
6. Click OK.
7. The next screen shows the "Keys" YEAR1 and Zones. *Make sure that **YEAR1** is correct and **Zones** is 1600.*



8. Click Save and Close.
9. Next go into Windows Explorer and make sure that a new directory has been created under CATALOG DIRECTORY\BASE\SHXX\NEWSCENARIO\.



10. Copy the 25 (or 26 if including the default.vpr, if present) required files from the base SHXX directory (located in COMMON_START_FILES\[By_Year] directory) to the new scenario directory. ***It is good practice to copy all required files to the new directory before attempting to edit any of the files.*** This helps preserve the base runs for each year.

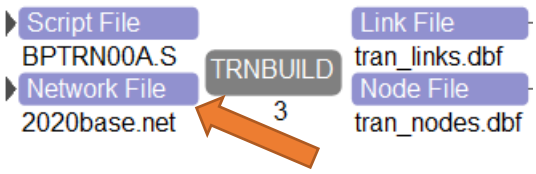
As stated above, the four files most likely to be modified for a new scenario include the base network (base.net), land use input (parcel_update_allocHH.csv), transit network (base.lin), and turn movement selection (turnnodes.s) files. Each of these files has specific steps for updating, while some of them have multiple ways of updating. The following sections describe the various steps to edit the model for a specific project scenario and view model results.

5. VIEW AND EDIT BASE NETWORK

Open and View Network

The base network (**20XXBASE.NET**) file should be edited in CUBE. It can be opened by:

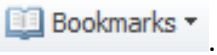
1. Navigating to the scenario directory in Windows Explorer and double clicking the file, or;
2. With CUBE already open:
    a. Using file>open, to open the network
    b. Double-clicking on the network file box from within an application, in the **MAPS/APPLICATIONS WINDOW** (see Figure 1)



Likely edits to the network include:

- Adding or deleting roadways;
- Adding or reducing lanes on roadways;
- Changing speeds on roadways;
- Changing direction of roads (e.g. changing link from two-way to one-way) or;
- Changing functional classification on roadways.

Once open, the network file looks like **Figure 6** (page 18). In this figure, the roadway network links are colored by number of lanes per direction. Roadways with one lane per direction are dark grey, roadways with two lanes per direction are blue, roadways with three lanes per direction are orange, and roadways with more than three lanes per direction are red. TAZ centroid connectors are dashed lines and Class I bike paths are green.

Saved views (bookmarks) can be invoked by clicking 

. This will bring up a choice of saving new bookmarks or restoring existing bookmarks. A number of bookmarks have been saved in the **DEFAULT.VPR** file.

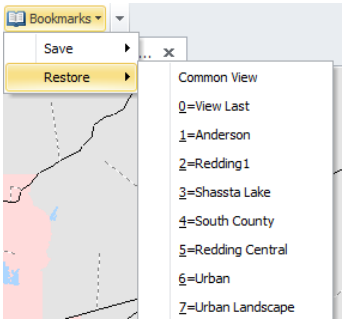
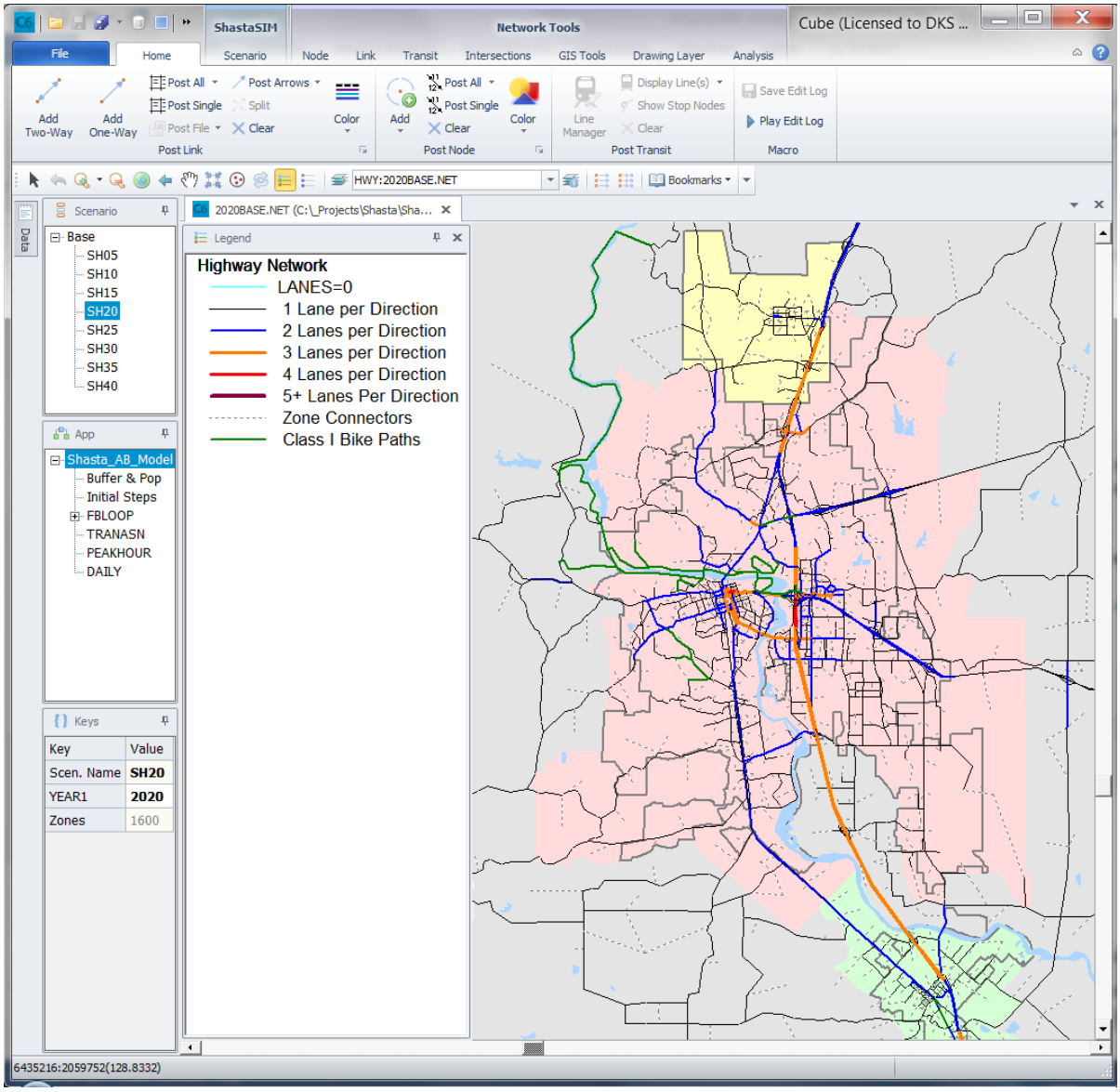
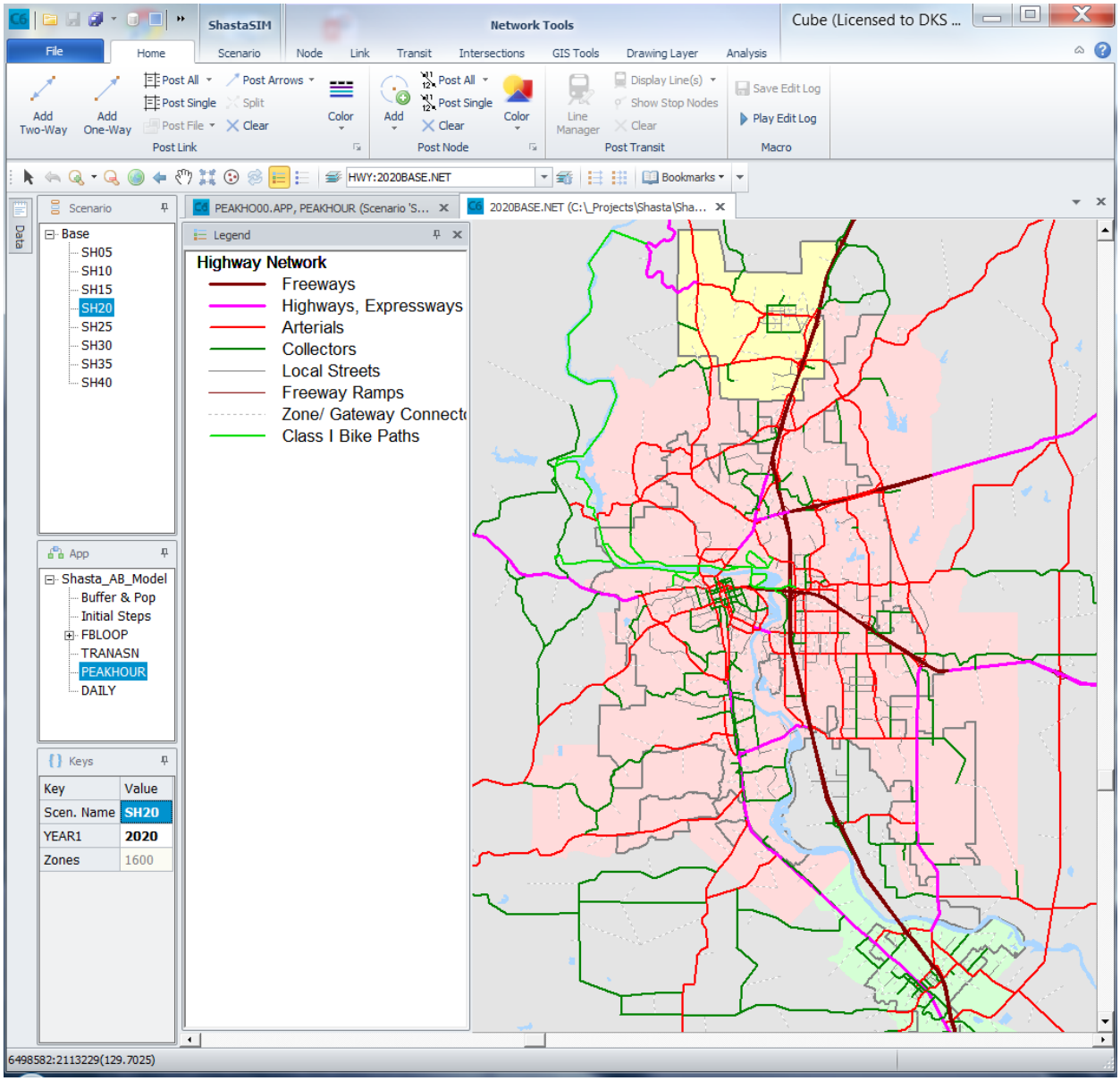


Figure 6: Base Roadway Network Lanes in CUBE



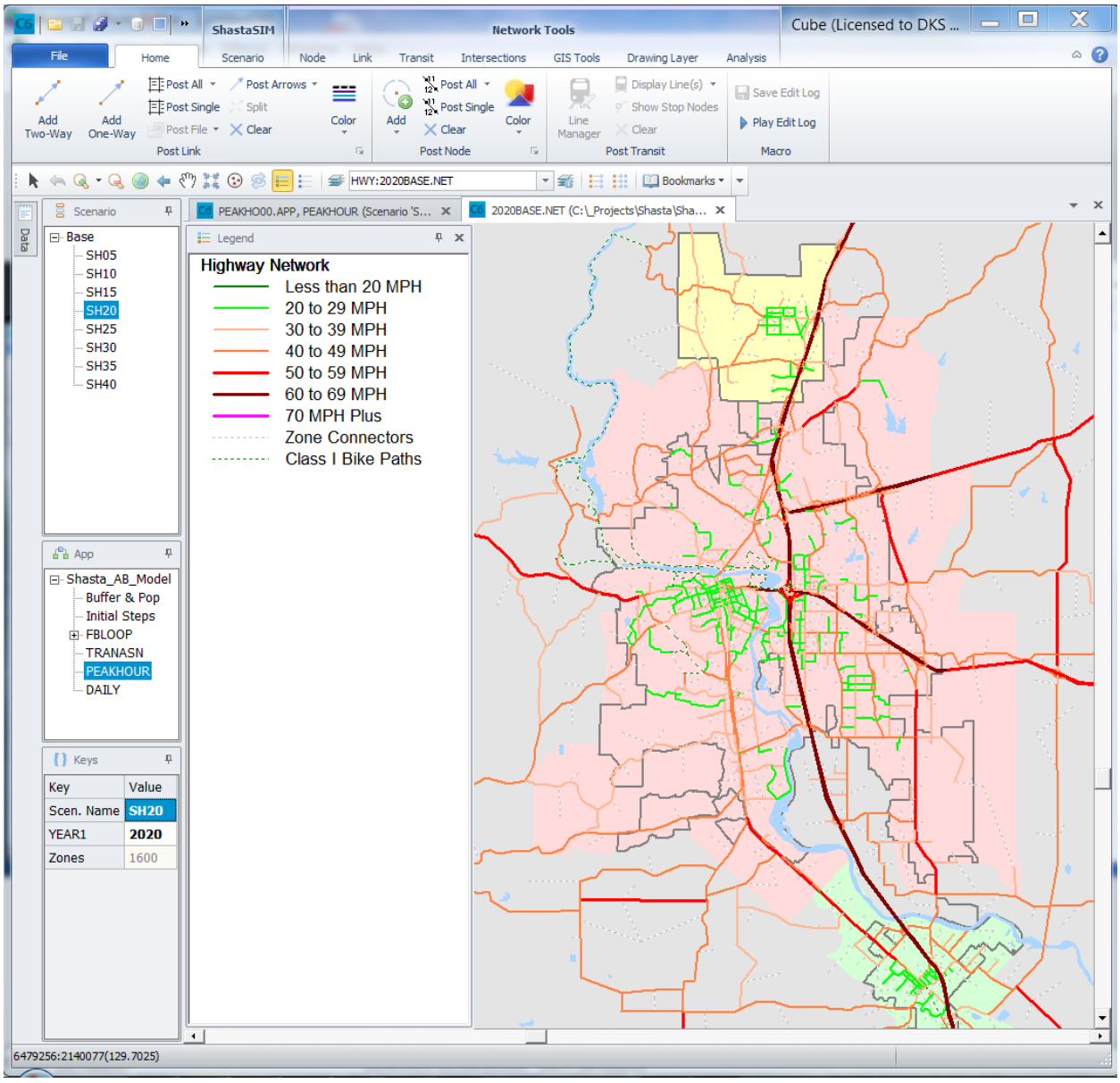
In **Figure 7** (page 19), roadways are shown color coded by facility type. Freeways (FACTYP = 1) are thick dark red, Highways and Expressways (FACTYP = 2 and 3) are magenta, arterials (FACTYP = 4) are red, Collectors (FACTYP = 5) are dark green, Local Streets (FACTYP = 6) are solid grey, Freeway Ramps (FACTYP = 7, 8, and 9) are thin dark red, Zone and Gateway Connectors (FACTYP = 10 and 11) are dashed grey, and Class I bike paths (FACTYP = 21) are light green.

Figure 7: Base Roadway Network Facility Type in CUBE



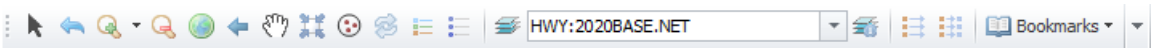
In **Figure 8**, roadways are shown color coded by speed. Slower speeds are in shades of green, medium speeds are in shades of orange, and higher speeds are in shades of red and magenta. Zone connectors and bicycle paths are dashed grey and green, respectively.

Figure 8: Base Roadway Network Speed in CUBE



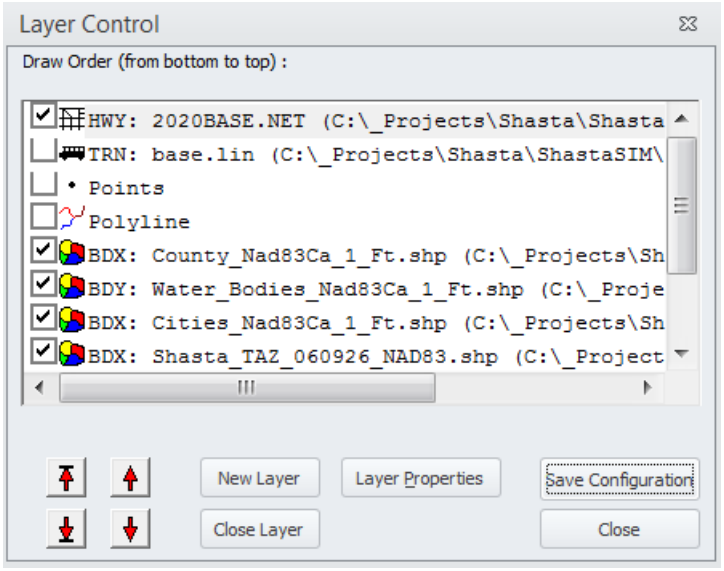
Quick Access Toolbar

The **QUICK ACCESS TOOLBAR** in CUBE contains a number of useful tools, which are discussed below.



1. Individual links can be selected by clicking .
2. Edits to the network can be undone by clicking . Note that this icon is greyed out if no edits have been made.
3. The view can be zoomed in by clicking and zoomed out by clicking .
4. The view can be zoomed to the entire extent of the network by clicking .
5. The view can be zoomed to the previous extent by clicking .
6. The view can be panned by clicking .
7. The view can be zoomed to a particular node by clicking , selecting the desired node, and the desired window width (in feet).
8. Layers (including networks, transit lines, point, polyline, and boundary shapefiles, and images) can be controlled by clicking . This brings up the LAYER CONTROL window (**Figure 9**) where layers can be turned on or off, added or deleted, or sources of layers can be changed.

Figure 9: Layer Control Window



a. Layers can be added by clicking New Layer, which brings up a browse window to find files on the computer's hard drive or network.
b. Layers can be turned on or off by clicking the check box next to the layer.

Layer sources and drawing properties can be changed by selecting a layer and clicking Layer Properties. Color settings (lines and fill) and posting are similar to those described below for networks and are invoked in their own parameters windows. See **Figure 10**, **Figure 11** and **Figure 12**.

Figure 10: Boundary Layer Parameters

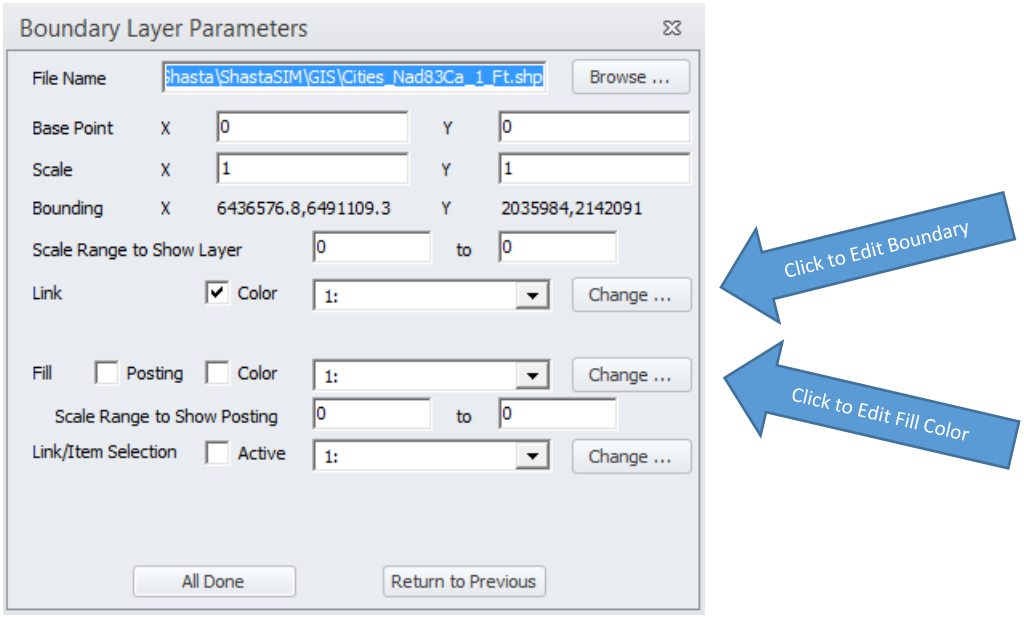


Figure 11: Boundary Layer Link Color Specifications

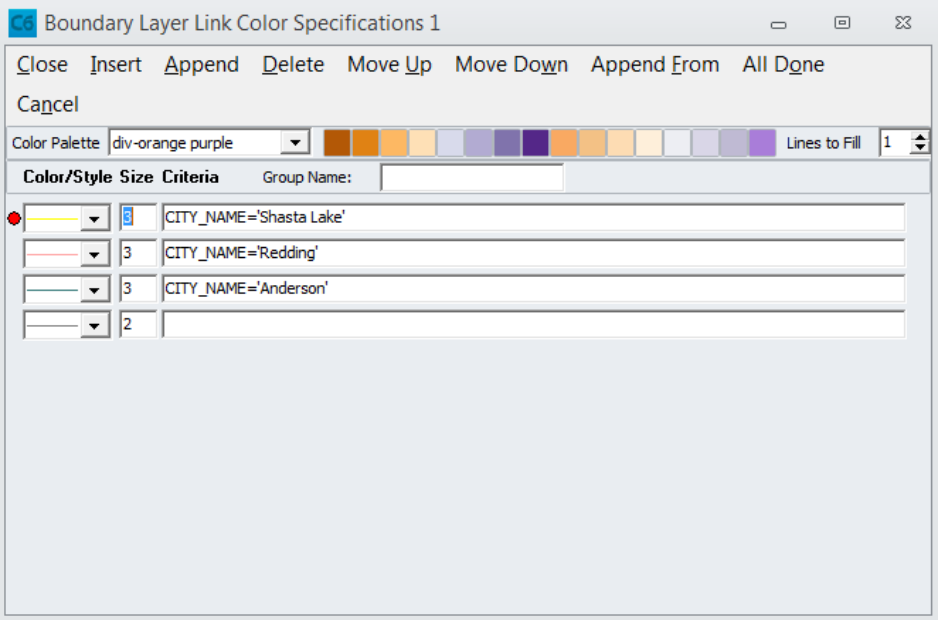
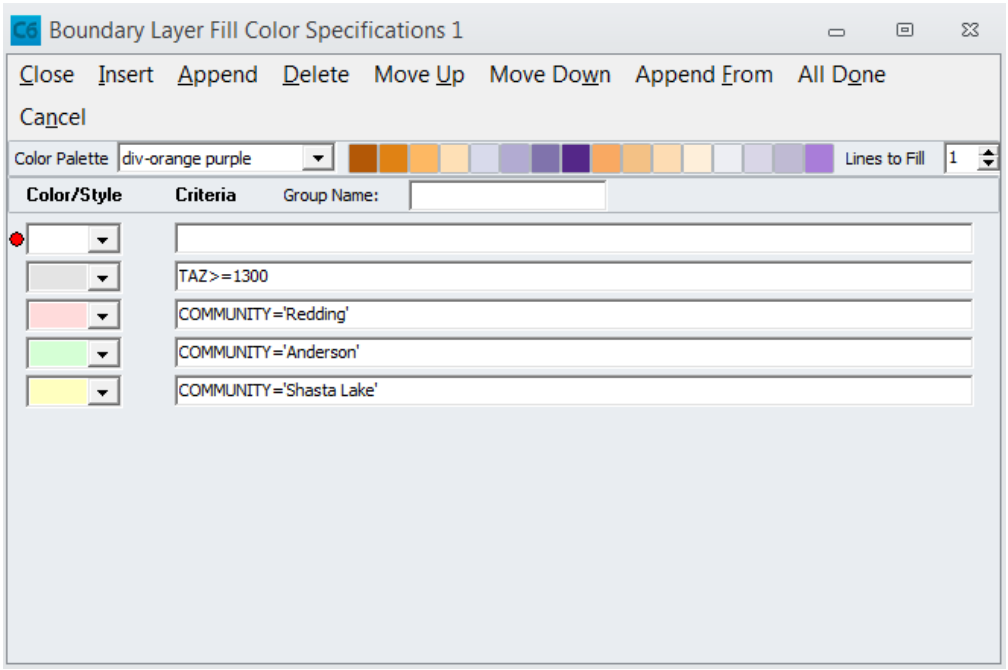


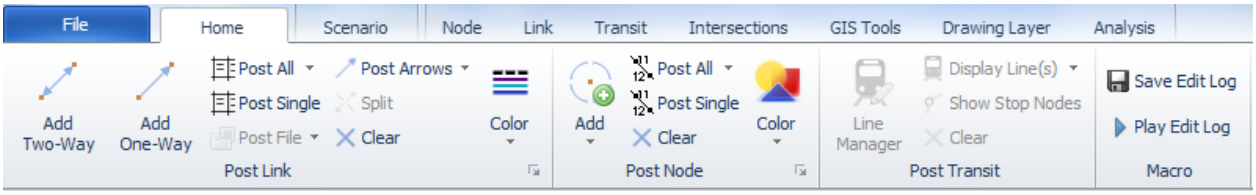
Figure 12: Boundary Layer Fill Color Specifications



Home Ribbon

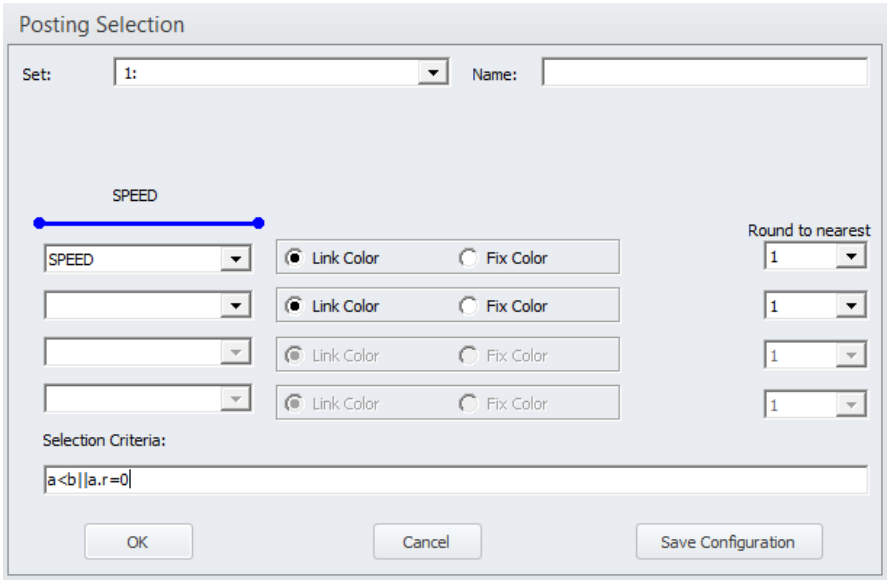
The **HOME** ribbon contains many useful tools for network viewing and editing.

Figure 13: The HOME Ribbon



1. Link attributes for all links can be posted by clicking Post All.
2. Link attributes for particular links can be posted by clicking Post Single.
3. Both of these selections bring up the POSTING SELECTION window (**Figure 14**) in which a variable can be selected for posting. Variables can be posted in the color of the link or by clicking on "Fix Color," which allows the user to specify a posting color. Variables can also be rounded by selecting from the drop down menu. Posting can be filtered by a formula. A typical formula for filtering is **a<b||a.r=0** which posts the variable on one side of the link only. ***Unfortunately there is no "post on one side of link" option so this complicated formula is used.***

Figure 14: Posting Selection Window



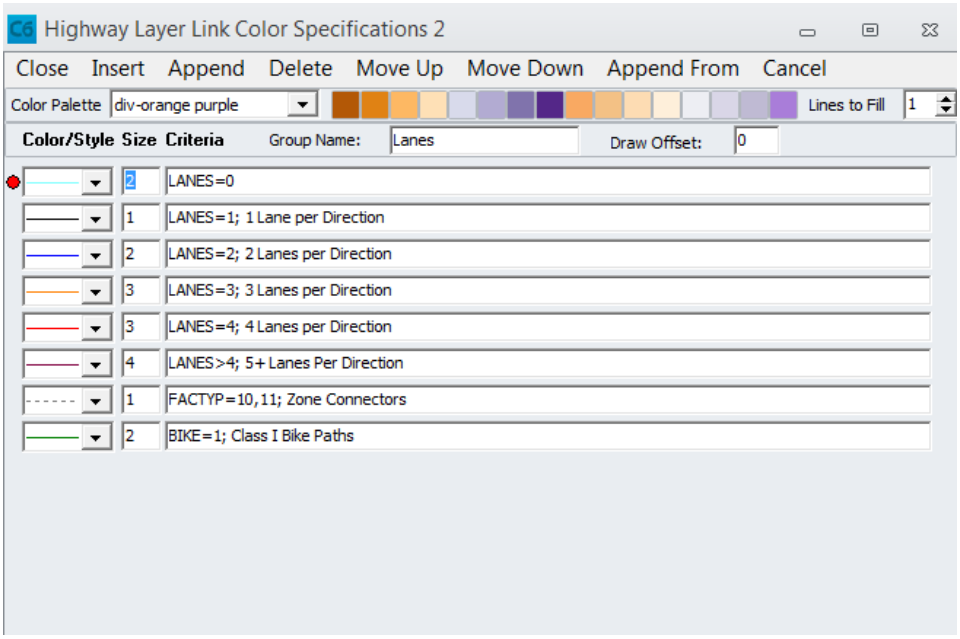
4. If desired, one-way links can be identified by clicking Post Arrows.

5. Link color settings can be changed by clicking 

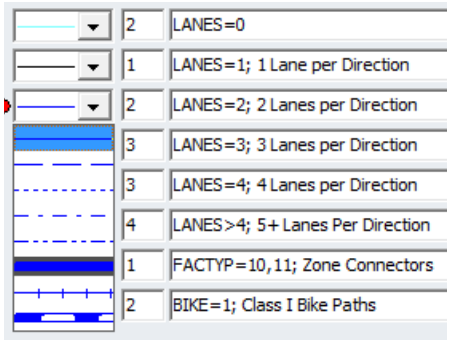
.

   a. Clicking  will bring up a window for changing the current color settings. See **Figure 15** for the standard highway layer link color specifications.

Figure 15: Highway Layer Link Color Specifications

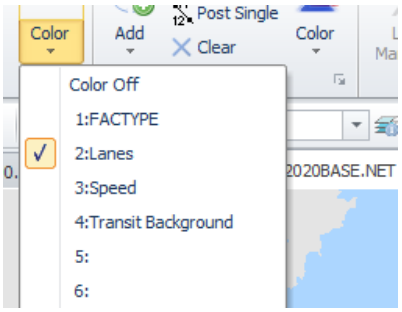


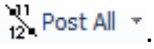
In this window, color and line style can be changed by clicking on the colored lines. Additional line styles can be inserted or appended, and definitions (including legend text) can be set for links with different characteristics – such as lanes. Text after a semi-colon will be displayed in the table of comments instead of the actual selection formula.

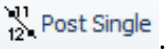


b. Clicking 

will bring up a list of available color settings that have been saved in the .VPR file. Any additional color settings added will show up in this list.

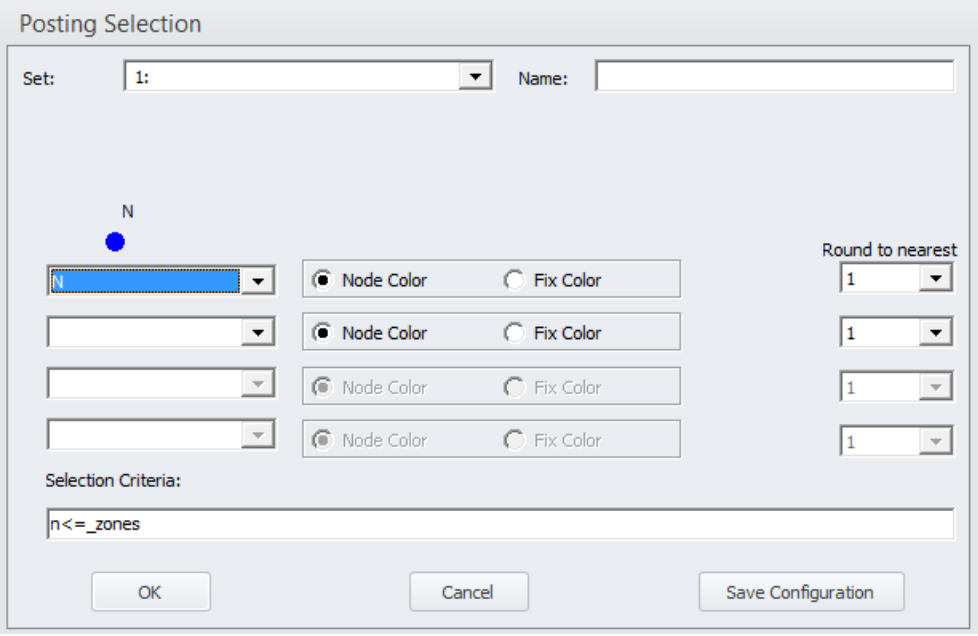


6. Node attributes on all nodes can be posted on links by clicking 

.
7. Node attributes on particular nodes can be posted by clicking 

.
8. Both of these selections bring up this window (**Figure 16**) in which a variable can be selected for posting. Variables can be posted in the color of the node or by clicking on "Fix Color," which allows the user to specify a posting color. Variables can also be rounded by selecting from the drop down menu. Posting can also be filtered by a formula. A typical formula for filtering is **n<=_zones,** which posts the node numbers for zone centroids only.

Figure 16: Node Posting Specifications

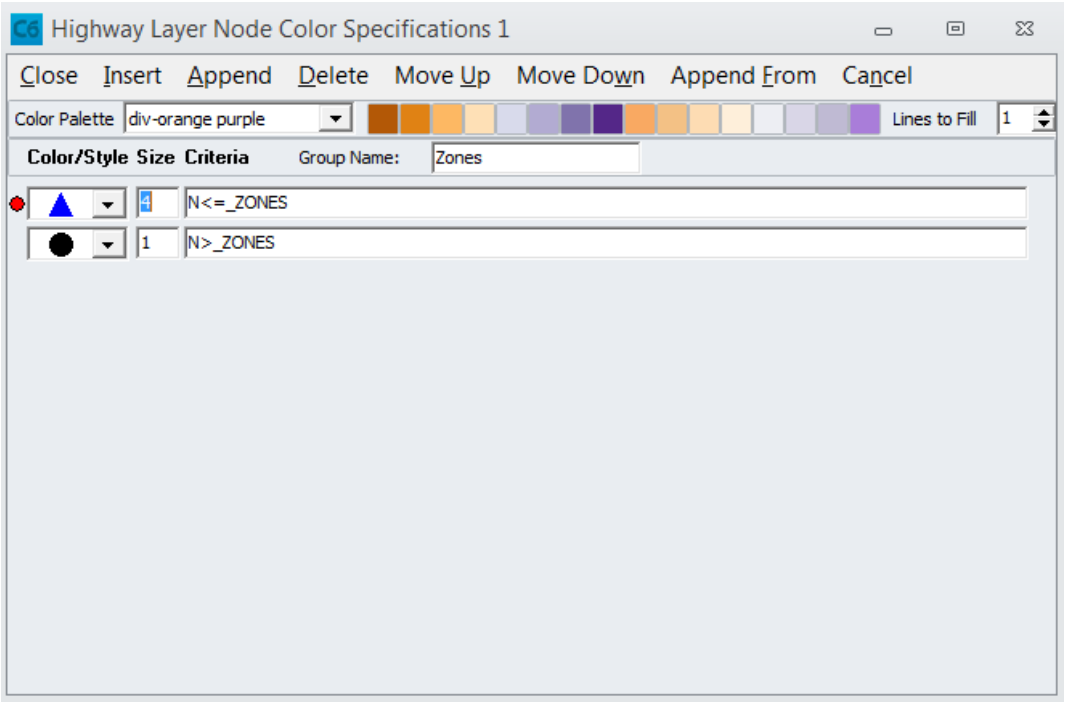


9. Node color settings can be changed by clicking 

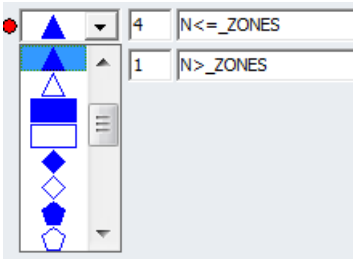
.

   a. Clicking  will bring up a window (**Figure 17**) for changing the current color settings.

Figure 17: Highway Layer Node Color Specification

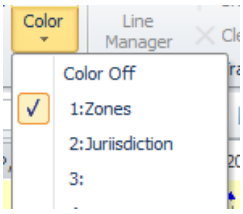


In this window, the color and marker shape can be changed by clicking on the colored shapes. Additional node styles can be inserted or appended, and definitions (including legend text) can be set for nodes with different characteristics – such as jurisdiction.



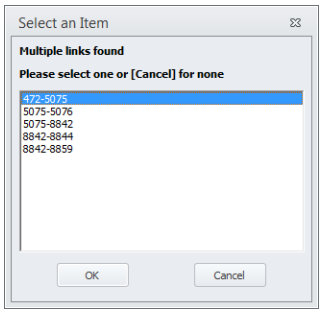
   b. Clicking 

will bring up a list of available color settings that have been saved in the .VPR file. Any additional color settings added will show up in this list.



Editing Existing Links

1. Existing links can be edited by first clicking to activate select mode. Clicking on a link will open the Highway Links table as shown in **Figure 19**. If the view is zoomed out and CUBE cannot determine which link to edit, the **Select an Item** window will open up, prompting the user to select the desired link.

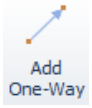


2. Once the desired link is selected, values in the Highway Links table can be edited to change facility type, number of lanes, speed, etc.
3. The **save** button at the top of the table must be clicked to save the changes, while the button can be used to discard changes.
4. Links can be realigned in two ways:
    a. Without clicking on the link first, clicking on the node at either end of the link will allow the user to move the node and any links attached to it.
    b. After first selecting the link, clicking on the node at either end of the link and dragging it to a different node will change the link so its end is at the new node instead of the old one. If the new location does not correspond to an existing node, CUBE will ask if the user wants to add a new A or B node.
5. Realigning links automatically updates the DISTANCE field of the link.

Add, Copy, Paste, and Split Links

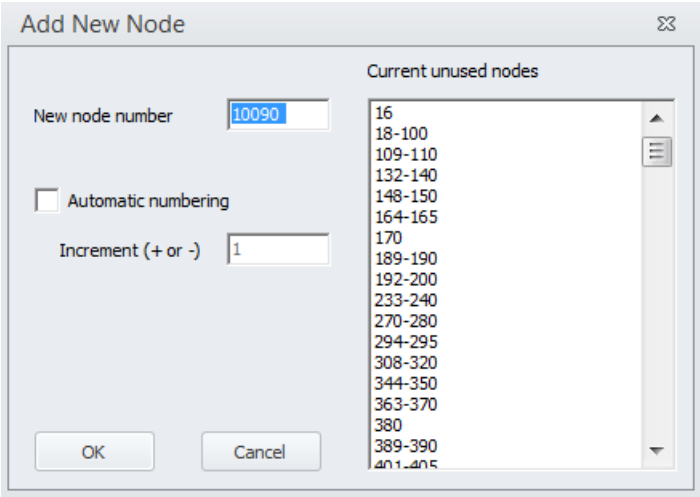
Add Links

1. New roadways can easily be added by clicking 

for two-way links or 

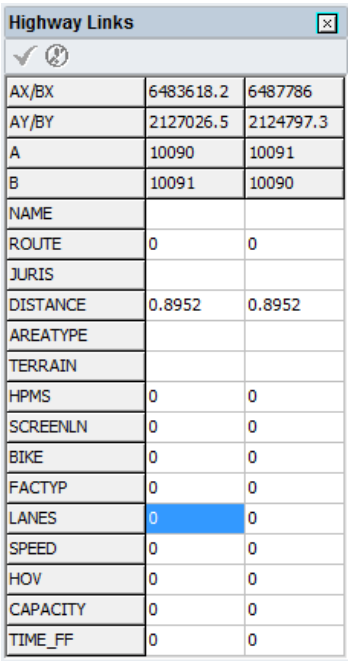
for one-way links.
2. Next, click either on an existing node or in open map space for the A node, and then click on another existing node or open map space for the B node. If open space is selected, a window will open for assigning new node or nodes. This window shows all nodes that are not currently used in the network. The default is for the highest existing node +1. ***Make sure that any added roadway nodes have a node number higher than 1600. Node numbers 1600 and below are reserved for zone and gateway centroids.***

Figure 18: Add New Node Window



3. Once a new link is added, clicking on it reveals a data table (Highway Links window) for the link and any link attributes that can be edited.

Figure 19: Highway Links Table

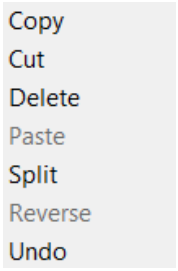


AX/BX	6483618.2	6487786
AY/BY	2127026.5	2124797.3
A	10090	10091
B	10091	10090
NAME		
ROUTE	0	0
JURIS		
DISTANCE	0.8952	0.8952
AREATYPE		
TERRAIN		
HPMS	0	0
SCREENLN	0	0
BIKE	0	0
FACTYP	0	0
LANES	0	0
SPEED	0	0
HOV	0	0
CAPACITY	0	0
TIME_FF	0	0

4. The **save** button at the top of the table must be clicked to save the changes, while the button can be used to discard changes.

Copy and Paste Links

1. To copy an existing link and its attributes to a new link, first left-click on the source link you want to copy to make it start blinking, then right-click on the source link.



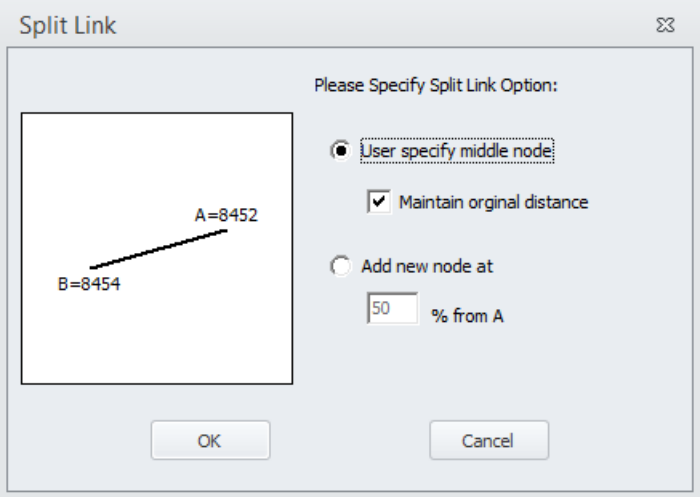
2. Next select **copy** from the resulting box, then right-click again anywhere in the blank space of the map, and select **paste** from the resulting box. Finally, select the desired A node and B node for the new link. If either end of the new link is not at an existing node, the program will prompt the user to create a new node and ask for the new node number, as described in step 2 above.

Splitting links

Splitting links is another useful tool, especially when adding new links or changing link attributes part way through an existing link. The process is similar to copying links.

1. First left-click, then right-click on the desired link. Click **split** in the resulting box. Next the tool offers the choice to use an existing node as the split point or split the link at some percentage of the distance between the "A" node and "B" node.

Figure 20: Split Link Window



2. The resulting links will share the same attributes as the existing link and distances will automatically be calculated for the two new shorter links.

Deleting Links

Links can easily be deleted by:

1. Clicking on the link and hitting the delete key on the keyboard, or;
2. Right-clicking on the link and clicking delete.

Saving Edit Logs

If desired, an edit log (text file) can be saved in order to document changes made to the network or to save changes for applying to another network. To save a log file, click Save Edit Log. To play a log file, click Play Edit Log. Logs include all added, split, modified, and deleted links and nodes. It should be noted that edit logs contain all changes since the network was last opened. If the user desires to save incremental changes in multiple log files, the network needs to be closed and reopened. Below is a sample log file (**Figure 20**) for changing the Facility Type (FACTYP) on one two-way link.

Figure 21: Edit Log Format

Sample.LOG * ×

```
HighwayLayerLogX,"C:\_Projects\Shasta\ShastaSIM\Base\SH20\2020BASE.NET",24,17,6/22/2014 10:16:23 AM
Node,N,X,Y,G01,G02,G03,G04,G05,G06,G07,G08,G09,G10,G11,G12,G13,G14,G15,G16,G17,JURISDCTN[13],COMMUNITY[19],AREATYPE[1],AT
Link,A,B,NAME[33],ROUTE,JURIS[8],DISTANCE,AREATYPE[1],TERRAIN[1],HPMS,SCREENLN,BIKE,FACTYP,LANES,SPEED,HOV,CAPACITY,TIME_FF
L,C,0;4206;8444;"SR 299";299;"",0.69;"R";"R";0;0;0;2,2;50;0;1200,0.828
L,C,0;8444;4206;"SR 299";299;"",0.69;"R";"R";0;0;0;2;1;50;0;1200,0.828
L,C,1;4206;8444;"SR 299";299;"";0.69;"R";"R";0;0;0;2;2;50;0;1200;0.828
L,C,1;8444;4206;"SR 299";299;"";0.69;"R";"R";0;0;0;2,2;50;0;1200;0.828
```

6. VIEW AND EDIT TRANSIT NETWORK

Transit line networks are actually ASCII text files (**base.lin**) and can be viewed and edited either in CUBE or by using a standard text editor. Due to a requirement of the software, loop routes *(routes where a bus goes in both directions on a road)* are coded as two separate routes – with one route for the outbound direction and one for the inbound direction. They are notated by a "N/S" or "E/W" designation at the end (example: RAB01N and RAB01S).

Each transit line consists of a header line(s) plus a list of all network nodes used by the transit line.

The first row or two for each line consists of the following, separated by commas:

- LINE NAME= (text, name of route)
- TIMEFAC= (numeric, bus transit time penalty compared to other vehicles)
- ONEWAY= (text, T=true)
- MODE= (numeric, Bus=2)
- COLOR= (numeric, color used to display line in CUBE)
- FREQ[1]= (numeric, peak frequency in minutes)
- FREQ[2]= (numeric, off-peak frequency in minutes)
- FREQ[3]= (numeric, not used in ShastaSIM)

Following the header lines and a final comma, all line nodes are listed in order, separated by commas. Nodes where buses do not stop are negative (,-xxxx,) while nodes where buses do stop are positive (,xxxx,). It should be noted that for bus transit (mode=2) all node pairs must represent links in the highway network. If two consecutive nodes in the transit line file do not correspond with a roadway network link, the model run will crash. ***Users should review the transit network after making edits to the transportation network to ensure that the model does not crash. Typically this is very important when eliminating or moving network links.***

An example from a ShastaSIM transit line file is shown in **Figure 22**. This shows RABA Route 1 north and south.

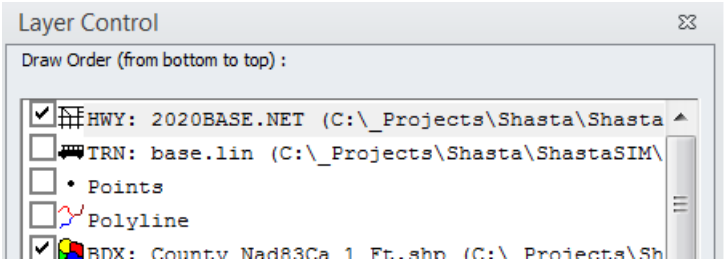
Figure 22: Transit Line File in TextPad Text Editor

base.lin ×

```
;;<<Trnbuild>>;;
LINE NAME="RAB01N", TIMEFAC=1.9, ONEWAY=T, MODE=2, COLOR=13,
     FREQ[1]=60, FREQ[2]=60, FREQ[3]=0, N=8915, -8913, -8912, -8910,
     8898, -8900, 8308, -8890, -8888, 8866, -8864, 8862, -5074,
     8838, -8836, -8834, 8832, -5642, -5643, -5644, -8594, -5226,
     -8596, 8604, -8606, 8608, -5233, 8612, -5234, 8622, -5235,
     8628, -5121, -5120, 8362, 8366, 5119, 8204, 8202, 5246, 5245,
     8201, 5248, 5247, 4860, 5249, 8200, 5250, 5251, 8198, 4859,
     8194, 5256, 8195, 5257, 8140, -5273, -5272, -8132, -5271, 8131,
     8130, -8126, -5280, -5279, -5278, 5277, 8120, -5276, 8032,
     5282, -5283, -7511, -8034, -8036, -8038, -5281, -4847, 8040,
     -5312, 8042, -5313, 8044, -5314, -8046, 5316, -5317, -8048,
     7512, 7513
LINE NAME="RAB01S", TIMEFAC=1.9, ONEWAY=T, MODE=2, COLOR=13,
     FREQ[1]=60, FREQ[2]=60, FREQ[3]=0, N=7513, 8072, 7515, -7514,
     8074, 8076, 8078, 8080, 8082, 8084, 8086, 8098, 8100, -5812,
     8116, 8148, -8150, -5624, 8152, -5626, -5625, 8180, 7504,
     -8184, 5629, 5628, 8185, 5627, -8192, 8394, 8392, -5131, 8386,
     8382, -5129, -5130, 8380, 8378, 8376, 8374, 8538, -8536, 8534,
     -5149, 5150, -8532, 8530, -5157, -5156, -5155, 8550, 5158,
     -8564, -8566, -5159, -5160, -8568, 8570, 8572, 8573, -7371,
     -8524, 5148, -5147, 8522, -8520, -5145, -5146, 8518, -5635,
     8580, 8578, -8582, 5161, -5640, -8584, -5641, 8586, -8588,
     -8590, -8592, -8594, -5644, -5643, -5642, 8832, -8834, -8836,
     8838, -5074, 8862, -8864, -8866, -8888, 8890, -8902, 8908,
     -8918, 8906, -8912, -2034, 2032, -2033, 8915
```

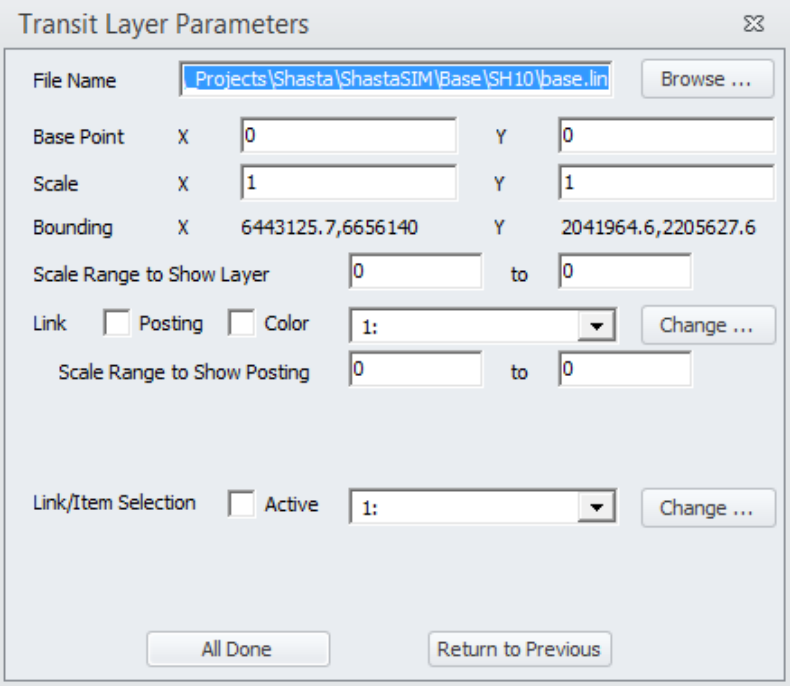
To load a transit file with the scenario network in CUBE (if the transit line file is not already loaded with the **DEFAULT.VPR** file), do the following:

1. Click to open Layer Control. The Layer Control box opens.



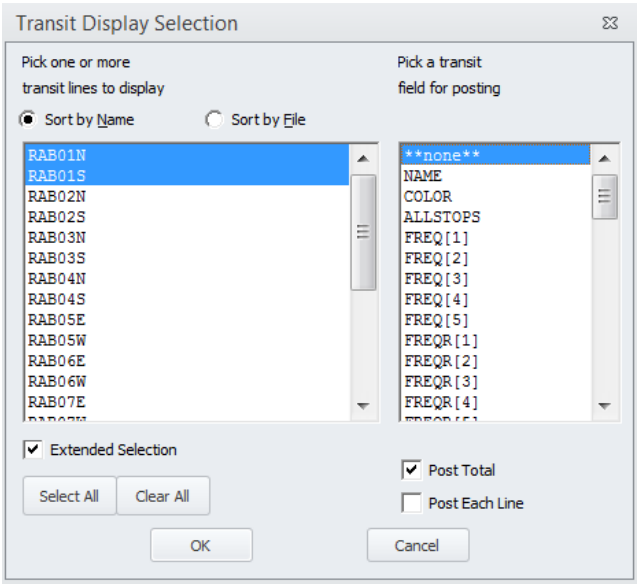
2. Next double-click Transit. The Transit Layer Parameters box opens.

Figure 23: Transit Layer Parameters Window

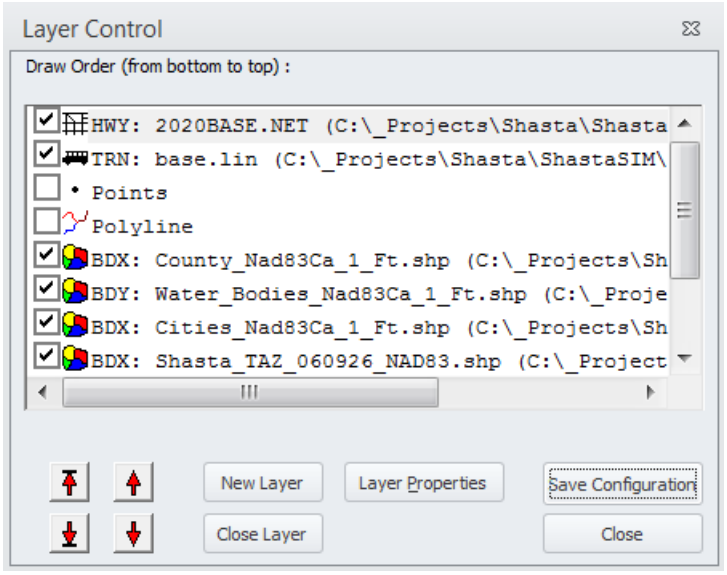


3. Select the appropriate base.lin file in the appropriate directory and click All Done.
4. The transit lines should all show up on the map, as shown in **Figure 26** (page 38). With the transit line file open, any links split while editing the transportation network will result in the transit line file being updated as well.
5. Click Display Line(s) to choose which lines to display. This brings up the **Transit Display Selection** window (See **Figure 24**). In this window, individual lines or groups of lines can be selected for display. Only the lines highlighted in blue will be shown.

Figure 24: Transit Display Selection Window



6. In order to edit an individual transit line in CUBE after the transit line file has been added to the map, first click to open Layer Control.



7. Next select TRN: base.lin and click to move the transit network to the "top" of the map. This will allow editing of transit lines. Click Close to return to the map.
8. Once the transit network is the active layer and the desired transit line is displayed, click anywhere on the line to enter edit mode. The line will turn yellow and a **Transit Route** table will appear on the map (**Figure 25**).

9. This table includes the same information seen in the text file.
    a. Attributes such as TIMEFAC, ONEWAY, MODE, COLOR, and FREQ[1,2,3] can be changed by editing the values on the right.
    b. Nodes, when selected, are highlighted on the map with a flashing circle. Nodes can be:
        i. Converted to or from a stop by adding or deleting the "-" from the node number.
        ii. Appended to the end of the file by clicking .
        iii. Added to a particular location in the file by clicking .
        iv. Removed from the file by clicking .
        v. Moved up in the file by clicking and down by clicking .
    c. The **save** button at the top of the table must be clicked to save the changes, while the button can be used to discard changes.
    d. Clicking the button allows the user to edit the transit line graphically. ***At this time it is not recommended to use this method as this method can be quite confusing to new users of CUBE. Detailed instructions can be found in the CUBE help.***

Figure 25: Editing a Transit Line in CUBE

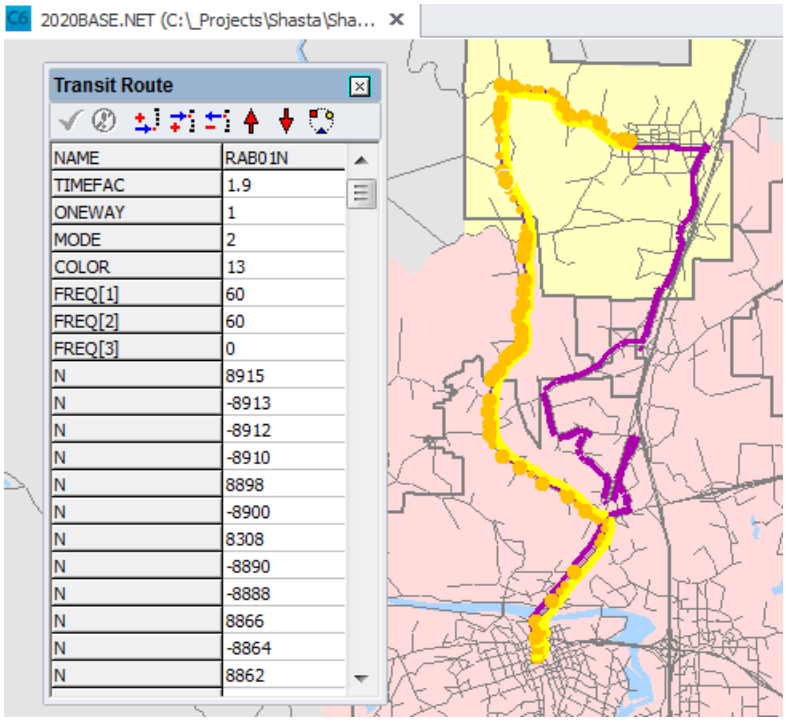
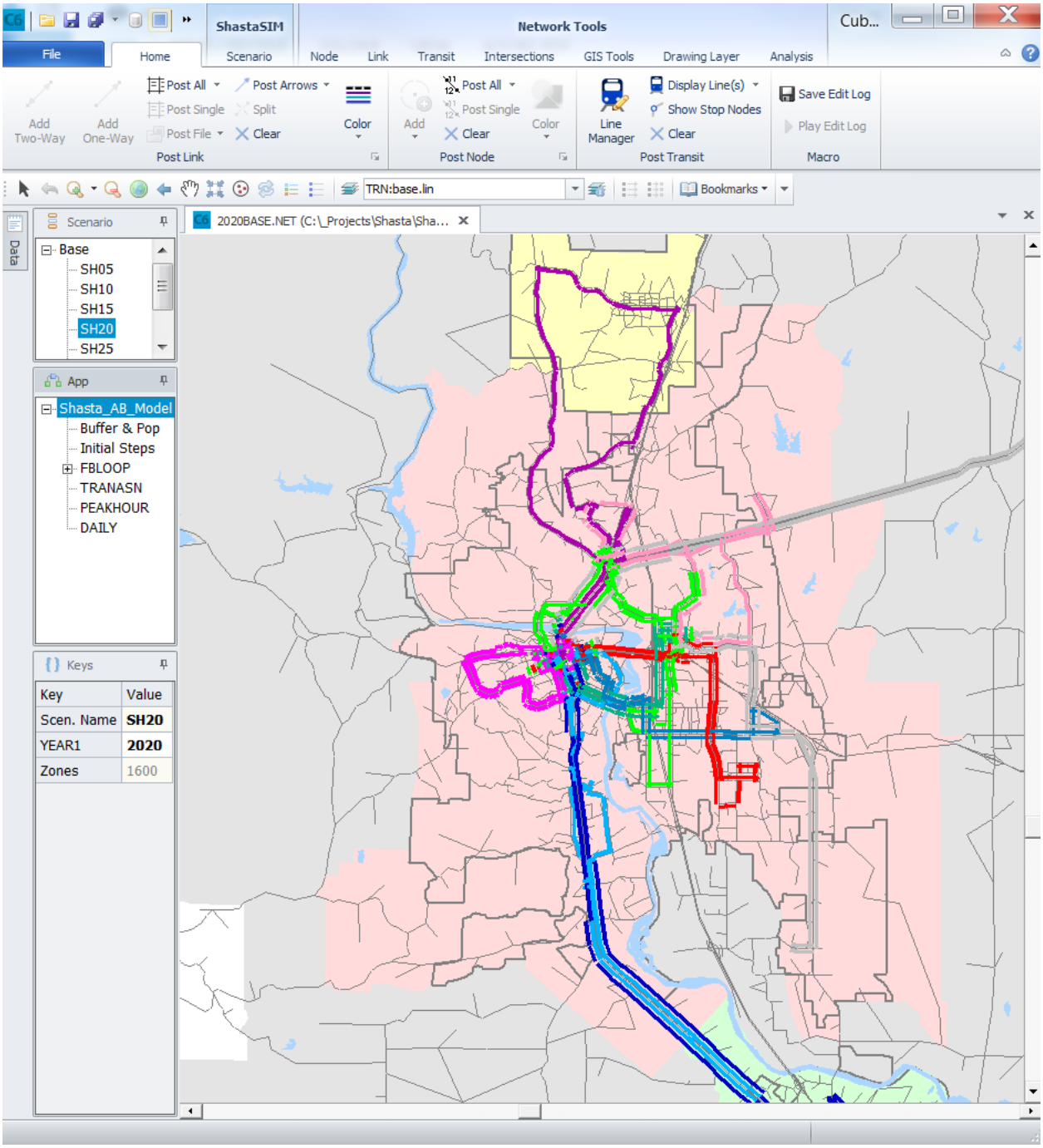


Figure 26: Transit Network Viewing in CUBE



7. LAND USE INPUTS

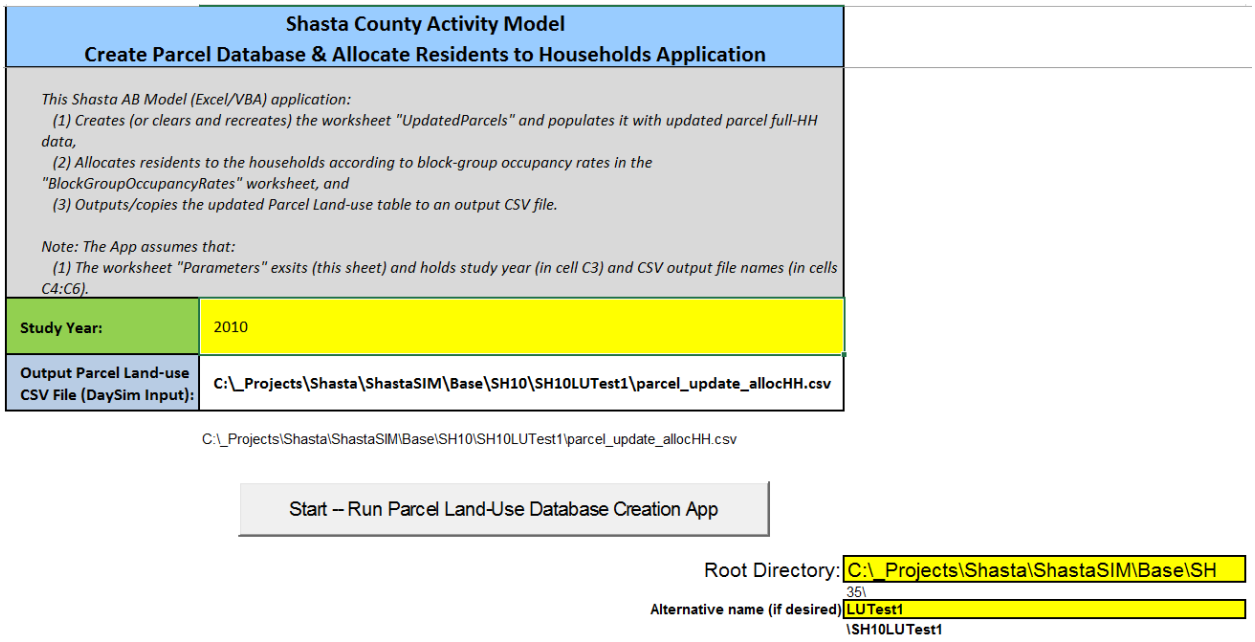
As stated in the ShastaSIM Model Development Report, the primary land use input to the model is a comma delimited text file called **PARCEL_UPDATE_ALLOCHH.CSV.** This file is created by a macro-enabled spreadsheet called **CREATE_SHASTASIM_PARCELS.XLSM**. The macro-enabled spreadsheet takes the base 2010 land use data (as derived from Shasta County parcel data), adds land use growth between 2010 and the forecast year, and finally allocates occupied (and vacant) housing units based on US Census data. The spreadsheet has been modified to estimate Strategic Growth Area (SGA) land use shifts in the cities and unincorporated shasta county. The growth shifts to the SGAs is restricted within the confines of each city or county boundary and don't erroneously pull growth from outside the jurisdictional boundary (i.e. land use growth redirected to the city of Shasta Lake SGA is pulled from growth within the city of Shasta Lakes city boundary file and doesn't pull growth from anywhere else in the county). This is a new feature starting with the 2015 Regional Transportation Plan, with Sustainable Communities Strategy. Currently the shifts are assumed as follows:

	% Shift to SGA(s)			
Jurisdiction	2020	2025	2030	2035
City of Anderson	4%	6%	8%	10%
City of Redding	3%	4%	5%	6%
City of Shasta Lake	4%	6%	8%	10%
Shasta County (unincorporated)	4%	6%	8%	10%

While these shifts can be modified in the spreadsheet, they should not be modified without direct input and approval by SRTA. Modifications to these assumptions for a project would render the results inconsistent with the adopted Regional Transportation Plan and Sustainable Community Strategy for the region.

The parameters sheet of the macro-enabled spreadsheet, where the forecast year is selected, is shown in **Figure 27**. Once the year is selected and the start button enacted, the macro creates the .csv file in the appropriate year's base scenario directory. Users can modify and update the root directory of the model by editing the cell beginning with "Root Directory." ***When making land use changes for a project, users will need to run the spreadsheet for each scenario year that needs to be evaluated. Users should also ensure the resulting output file is going to the correct directory location.***

Figure 27: Create_ShastaSIM_Parcels.xlsm Parameters Sheet



On page 47, **Figure 30** shows the land use data fields included in the **PARCEL_UPDATE_ALLOCHH.CSV** land use input file used for ShastaSIM model runs. Key land use input variables (such as occupied households, employment, and students) are highlighted in bold.

Editing Land Use

Individual parcels or groups of parcels can be modified to represent new projects. Changing the number of employees or households on a set of existing parcels is the easiest method of changing land use. The **CREATE_SHASTASIM_PARCELS.XLSM** or the **PARCEL_UPDATE_ALLOCHH.CSV** files may be edited to modify land use for a scenario. However, careful consideration should be made before editing either land use file.

Parcel_Update_AllocHH.csv

For individual project analysis purposes, where the user wants to measure the full impact of the project at the assumed build-out year or years (e.g. 2020, 2030), ***it is recommended that users edit a copy of the* PARCEL_UPDATE_ALLOCHH.CSV *file from the "parent" scenario.*** This ensures all of the assumed land use changes for the project are fully accounted for in the analysis. The regional forecast assumptions that are built into the macro (see below discussion) are already factored into this file for each "parent" scenario (i.e. SH15, SH25). Users can open and run the **SHASTASIM_COMPARE_INPUTS.CAT** to ensure that the model runs accounted only for the specific changes associated with the project. ***Typically this process would be done by developers who propose a project to a lead agency or by a lead agency in evaluating a***

proposed project that was submitted.

Steps to edit PARCEL_UPDATE_ALLOCHH.CSV:

1. Copy **PARCEL_UPDATE_ALLOCHH.CSV** from the "parent" scenario to the newly created "child" scenario (e.g. copy file from SH25 into a new SH25.Alt1 folder)
2. Open up the file in Microsoft Excel
3. Identify the parcel(s) that should be edited based on the Shasta County Assessor's Parcel Numbers (APN) for the project parcels. ***Note: Users should be aware that the APN is identified as "ASMT" within the travel model files.***
4. Identify the necessary travel model parcel information by using the travel model GIS map:
    a. In ArcGIS open **SRTA_BASEMAP.MXD** in the SHASTASIM\GIS\ directory. Assuming all GIS files are present, the ArcGIS window should look like **Figure 28**. This ArcGIS project has many layers that can be toggled on and off, including GIS Roadways, CUBE Master Network Roadways, and GIS based Bus Routes. These can all be turned on or off by clicking the check box in the table of contents to the left of the map.Zoom into the location of the project parcel(s). **When the window is zoomed in to 1:4000 scale or closer**, the APN for the parcel is displayed in black and the PARCELID of the corresponding record in the model land use input is displayed in grey next to a grey dot representing the XY coordinates of the land use record. A number of saved views can also be invoked by clicking Bookmarks. An example of a large vacant parcel in Anderson is shown in **Figure 29** and described as follows:
        i. ASMT: 201940009000
        ii. APN: 201-940-009-000
        iii. PARCELID: 78584

Figure 28: SRTA_BASEMAP.MXD in ArcGIS

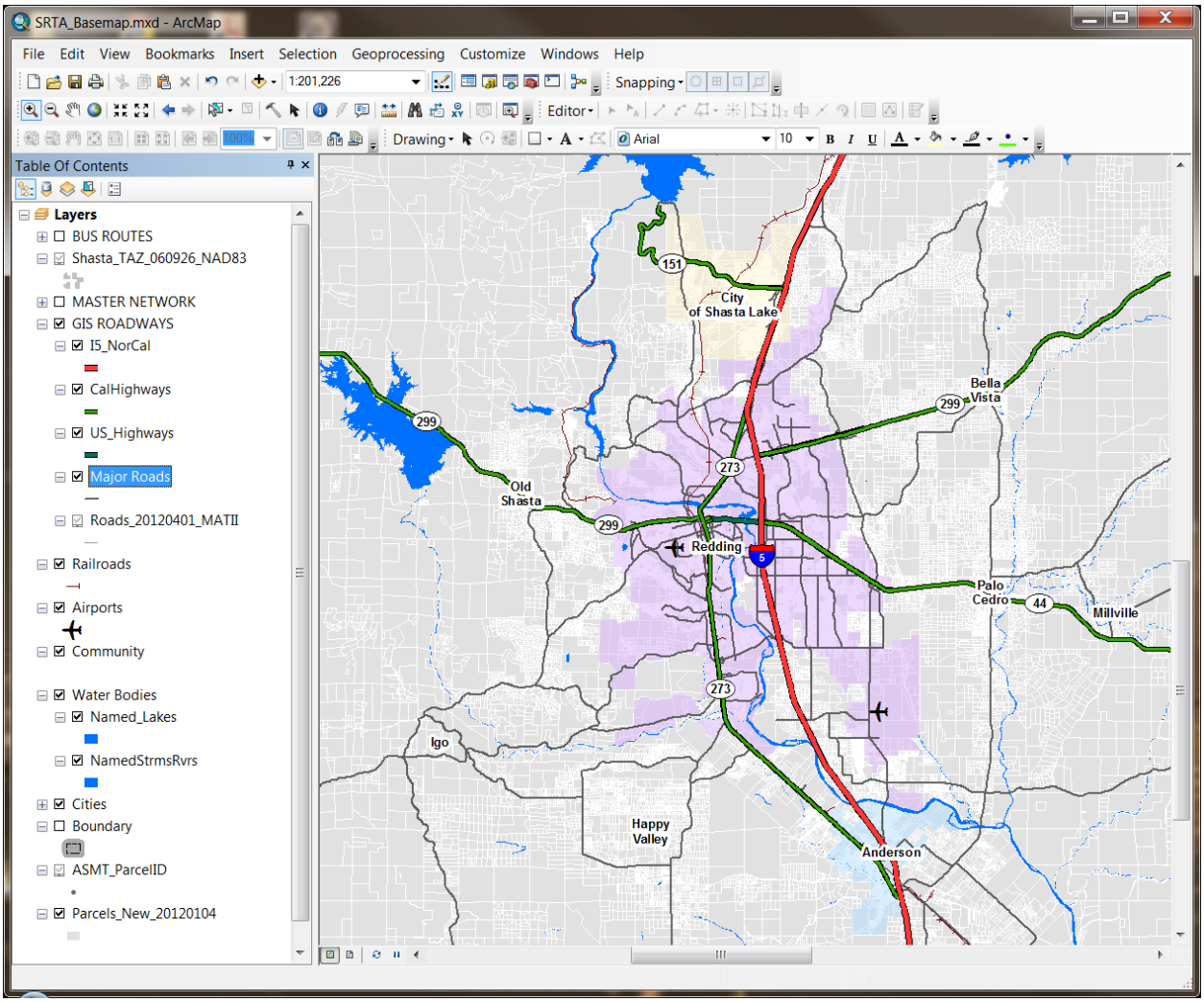
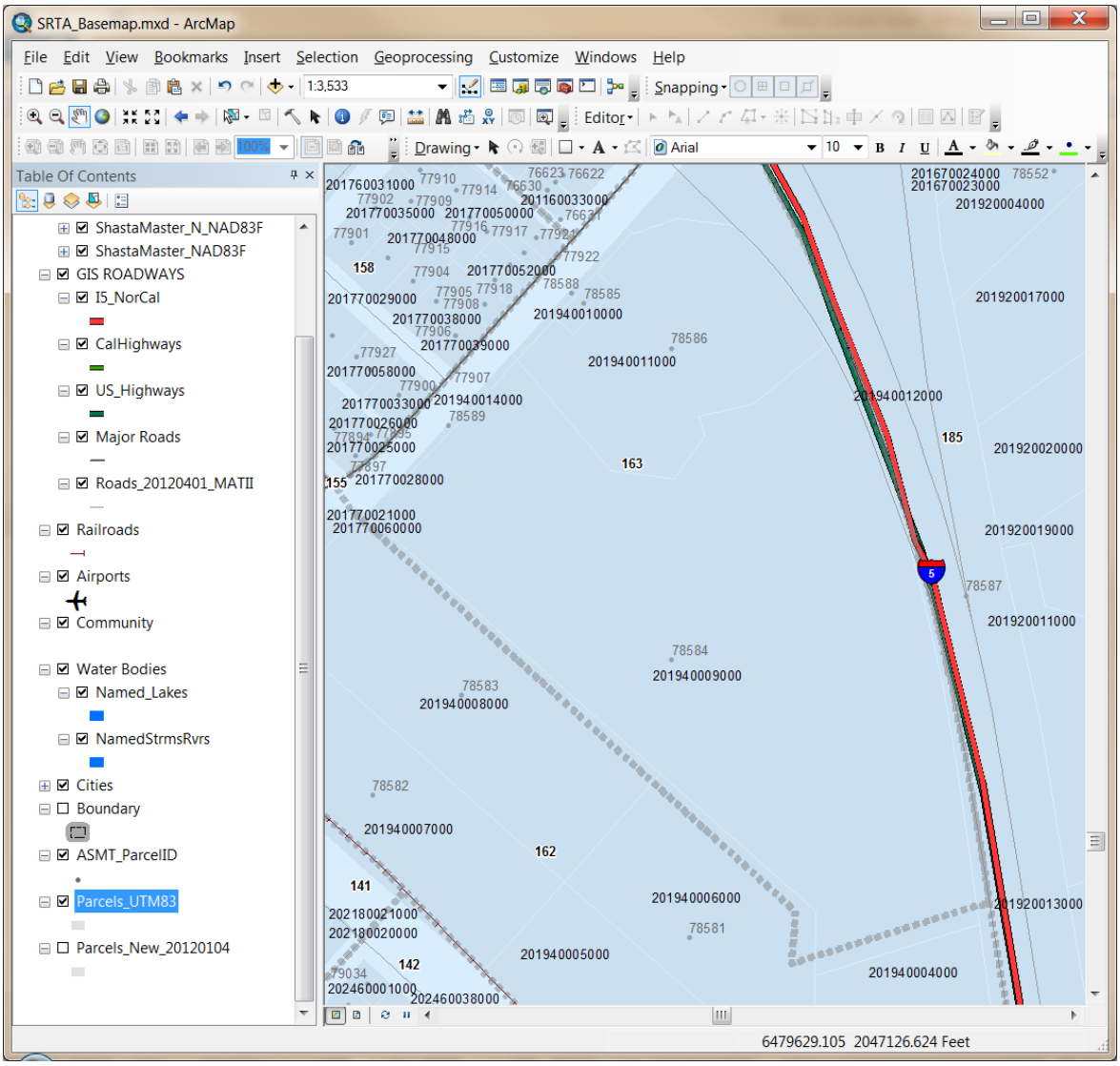


Figure 29: GIS Detailed View of Parcels



5. Open up the **PARCEL_UPDATE_ALLOCHH.CSV** file in the project folder
6. Highlight the 'parcelid' column (this should be column A in the file)
7. Search for the appropriate 'parcelid' that was identified in step 5b (use ctrl+F for a fast search)
8. Make the appropriate residential or employment land use edits
    a. For residential edits
        i. Identify the type and number of dwelling units (households) you want to add. The following residential types are available (for more information see Chapter 2 of the *ShastaSIM Model Development Report*):
            1. SFDU (column G)

2. MF2_4DU (column H)
3. MF5+DU (column I)
4. MHDU (column J)

ii. Add the appropriate amount of dwelling units by type (columns G-K).

iii. Add the total number of dwelling units under TOT_DU (column K). Make sure this column totals the number of dwellings units desired. The .csv file does not contain any formulas and can only retain cell values.

iv. Identify the total number of dwelling units that should be occupied (columns L-P) by residential type:

1. SFHH (column L)
2. MF2_4HH (column M)
3. MF5+HH (column N)
4. MHHH (column O)

v. Add the total number of occupied dwelling units under TOT_HH (column P)

NOTE: Generally columns G-K should match columns L-P. This ensures that the model understands that a specific number of dwelling units should exist on the associated parcel and that 100% of those units should be occupied.

b. For employment edits

i. Identify the type and number of employment jobs to add in columns T through AC. The following employment types exist:

1. Empedu_p - education
2. Empfoo_p - food
3. Empgov_p - government
4. Empind_p - industrial
5. Empmed_p - medical
6. Empofc_p - office
7. Empret_p - retail
8. Empsvc_p - service
9. Empoth_p - other

ii. Ensure that emptot_p (column AC) matches the sum of columns T-AB

9. Save the file and run the model

Users should be aware that the steps above apply only to one scenario year. For projects where multiple model year runs are necessary, steps 6-10 above must be repeated for each scenario.

Create_ShastaSIM_Parcels.xlsm

Users may elect to edit land use in the **CREATE_SHASTASIM_PARCELS.XLSM** file, which would create a new **PARCEL_UPDATE_ALLOCHH.CSV** file for the given scenario. **However, because the macro accounts for specific forecast assumptions through year 2030, users are cautioned in using the macro**. The specific forecast assumptions accounted for in the macro are:

1. The region's typical occupancy rates (i.e. a percentage of all available retail space is considered vacant) for employment related land uses assumes that they do not return to "normal" occupancy rates until year 2030. This is due to an assumption that the region does not fully recover from the 2008 recession until year 2030.
2. Occupied households for residential land uses are controlled by the typical residential occupancy rate as identified by the US Census Bureau.

Generally this process would be used for scenario planning purposes by a lead agency.

Steps to edit CREATE_SHASTASIM_PARCELS.XLSM:

1. Identify the parcel(s) that should be edited based on the Shasta County Assessor's Parcel Numbers (APN) for the project parcels, using **SRTA_BASEMAP.MXD** as described above.
    a. ***Note: Users should be aware that the APN is identified as "ASMT" within the travel model files.***
2. Open up **CREATE_SHASTASIM_PARCELS.XLSM**
3. Click 'save as' and create a new excel table using the following naming convention: **CREATE_SHASTASIM_PARCELS_[INSERT SCENARIO NAME].XLSM**
4. Click the 'LU_Growth' worksheet tab
5. Search for the APN(s) in the "ASMT" column
6. Click the "LU_Growth" worksheet tab
7. Search (via 'parcelid') to see if additional land use growth assumptions exist for the parcel. Steps 7a and 7b describe what to do if forecast information exists or not.
    a. **Scenario 1 - If forecast assumptions already exist for the parcel:**
        i. Review existing forecast assumptions and edit columns K through AD as appropriate.
            1. Columns K – S, U – Y, and AA are optional items and only help to provide more data.
            2. Columns **T**, **Z**, and **AB** are required, and are dependent on the type of project.
        ii. See **Figure 31** for a description of the columns in the LU_Growth tab of the worksheet. Users can refer to Table 1 of the *ShastaSIM Model Development Report* for the Parcel2010_fullHH tab of the worksheet.

b. Scenario 2 - If forecast assumptions don't exist for the parcel:

i. Go to the end of the table and use one of the sample rows already included at the bottom of the worksheet (see **Figure** 32 for an example).

1. Filling in the ParcelID in Column A will automatically fill in **Columns B – J** in the row.
2. **Column T** (model land use) can be filled in by selecting the cell and using the drop down menu (click on arrow to the right) of pre-selected model land use categories.
3. **Column Z** (quantity of dwelling units or employees) can be filled in by entering the desired number of dwelling units or employees.
4. **Column AB** (year of implementation) can be filled in by entering the desired year of implementation for the project (as stated previously, if portions of a project develop over time, use separate rows with different years for phases of the project).
5. **Column AD** (comments) can be filled in with notes describing the project.
6. **Column AC** (percentage of project to include) will automatically update based on the year selected for the row.
7. **Columns AE – AS** (land use to be added) will automatically be updated.

ii. If more rows are necessary than the rows provided, copy and add more rows at the bottom of the sheet as needed. ***NOTE: Users should be aware that there should be one row per year for each residential forecast or employment forecast for the project.*** For example, if a project assumes 25 single-family units for year 2020, 30 single-family units for year 2025, 25 multi-family units for year 2025 and 25,000 square feet of retail space for year 2025, then there should be one row for each assumption.

8. Save your edits and run the macro to create the new **PARCEL_UPDATE_ALLOCHH.CSV** file. ***(Make sure the new file is located in the correct directory)***

9. Open up ShastaSIM.cat and run the model

Figure 30: Parcel data Input (PARCEL_UPDATE_ALLOCHH.CSV) File Format

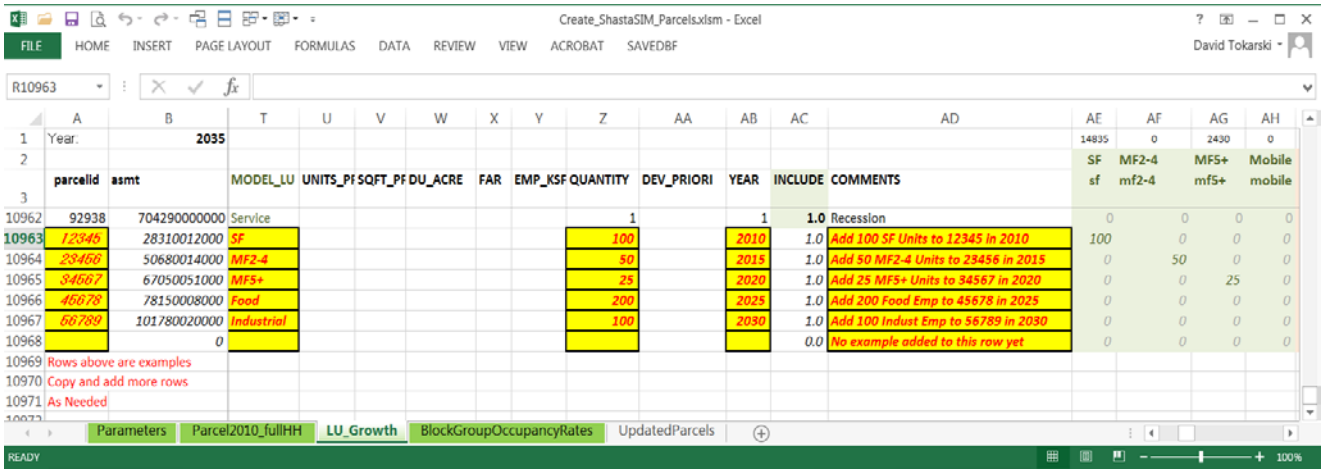
FIELD	DESCRIPTION
Parcelid	parcel ID number
xcoord_p	X coordinate – state plane feet
ycoord_p	Y coordinate – state plane feet
sqft_p	Area – square feet
taz_p	TAZ number
block_p	census block
SFDU	single family dwelling units on parcel
MF2_4DU	multi-family (2-4 units) dwelling units on parcel
MF5+DU	multi-family (5+ units) dwelling units on parcel
MHDU	mobile home dwelling units on parcel
TOT_DU	total dwelling units on parcel
SFHH	**single family occupied households on parcel**
MF2_4HH	**multi-family (2-4 units) occupied households on parcel**
MF5+HH	**multi-family (5+ units) occupied households on parcel**
MHHH	**mobile home occupied households on parcel**
TOT_HH	total occupied households on parcel
stugrd_p	**grade school enrollment on parcel**
stuhgh_p	**high school enrollment on parcel**
stuuni_p	**university enrollment on parcel**
empedu_p	**educational employment on parcel**
empfoo_p	**food employment on parcel**
empgov_p	**government employment on parcel**
empind_p	**industrial employment on parcel**
empmed_p	**medical employment on parcel**
empofc_p	**office employment on parcel**
empret_p	**retail employment on parcel**
empsvc_p	**service employment on parcel**
empoth_p	**other employment on parcel**
emptot_p	**total employment on parcel**
parkdy_p	off-street daily parking on parcel
parkhr_p	off-street hourly parking on parcel
ppricdyp	off-street daily parking price
pprichrp	off-street hourly parking price
track	census tract
group	census block group

Figure 31: LU_Growth Tab File Format for CREATE_SHASTASIM_PARCELS.XLSM

Column	FIELD	DESCRIPTION
A	Parcelid	parcel ID number
B	asmt	Shasta County Assessor Parcel Number (APN)
C	xcoord_p	X coordinate – state plane feet
D	ycoord_p	Y coordinate – state plane feet
E	sqft_p	Parcel Area – square feet
F	taz_p	TAZ number
G	TRACT10	Census Tract
H	GROUP10	Census Block Group
I	BLOCK10	Census Block
J	GEOID10	2010 US Census Geo ID
K	NAME	Name of potential project
L	SOURCE	Source of information (could be lead agency, developer or specific data file (map or GIS) provided)
M	OWNER	Legal owner of the parcel
N	PIN	Same as ASMT (in some cases, in others, blank)
O	ADDRESS	Street address number
P	STNAME	Street name
Q	ACRES	Number of acres for parcel
R	AREA	Area of parcel (in square feet)
S	MODEL_LU (Black text)	Type of land use – previous 4-step model land use category (Optional item to include)
T	MODEL_LU (Green text)	Type of land use – new ShastaSIM category: Education, Food, Government, Industrial, Medical, MF5+, Mobile,
U	UNITS_PROP	Number of residential units proposed
V	SQFT_PROP	Amount of employment square footage proposed
W	DU_ACRE	Number of residential dwelling units per acre
X	FAR	Floor Area Ratio
Y	EMP_KSF	Square footage (1,000 sf) per employee
Z	QUANTITY	Number of units to be built OR amount of jobs assumed
AA	DEV_PRIORI	Development Priority [1-5 with 1 being highest]
AB	YEAR	Year that residential units should be assumed to be built OR number of employees that should be created (by
AC	INCLUDE	Determines how much of growth to include (depends on forecast year selected, always between 0.0 and 1.0)
AD	COMMENTS	Additional user comments
AE	sf	single family dwelling units on parcel
AF	mf2-4	multi-family (2-4 units) dwelling units on parcel

Column	FIELD	DESCRIPTION
AG	mf5+	multi-family (5+ units) dwelling units on parcel
AH	mobile	mobile home dwelling units on parcel
AI	studk12p	grade/high school enrollment on parcel
AJ	studunip	university enrollment on parcel
AK	empedu_p	educational employment on parcel
AL	empfoo_p	food employment on parcel
AM	empgov_p	government employment on parcel
AN	empind_p	industrial employment on parcel
AO	empmed_p	medical employment on parcel
AP	empofc_p	office employment on parcel
AQ	empoth_p	other employment on parcel
AR	empret_p	retail employment on parcel
AS	empsvc_p	service employment on parcel

Figure 32: LU_Growth Tab Added Rows in CREATE_SHASTASIM_PARCELS.XLSM



8. Running Comparison Applications and MOE Calculations

Once a model scenario is run, a series of additional CUBE applications are available to compare and contrast scenario inputs and outputs, as well as to calculate various measures of effectiveness (MOE). Some of the MOEs are the same as those previously calculated with the four step model and some are new with the activity based model. Three CUBE catalogs have been created for comparing inputs, outputs, and doing MOE calculations:

- **ShastaSIM_COMPARE_INPUTS.CAT**
- **ShastaSIM _COMPARE_OUTPUTS.CAT**
- **ShastaSIM _COMPARE_TRANSIT.CAT**

In Cube Application Manager, scenarios can be selected for evaluation by clicking on the appropriate scenario in the Scenarios Pane on the top-left side of Cube. Individual applications can be opened visually by double clicking on the application name in the Applications Pane on the left side of Cube. Applications can also be run by right-clicking the application and then adding the desired scenarios for evaluation.

Compare Inputs Application

The **ShastaSIM_COMPARE_INPUTS.CAT** can be opened in CUBE using the same methods described on **page 14**. Opening the catalog provides a list of available applications to choose from in the Application Pane. Any of these applications can be run by right-clicking on them to bring up the Run Catalog window.

The Model Inputs application includes the following nine modules:

LU Parcels CSV to DBF: This module takes the land use input (**PARCEL_UPDATE_ALLOCHH.CSV**) and converts it into a .DBF file for use in other modules. The input .CSV file is located in the scenario directory. The resultant .DBF file is located in the COMPARE\PARCEL directory and is called **{SCENARIO_CODE}PARCEL_UPDATE.DBF**. It includes households, students, and categorized employees per parcel. All parcel records are maintained.

Figure 33: Run Model from Scenario Pane

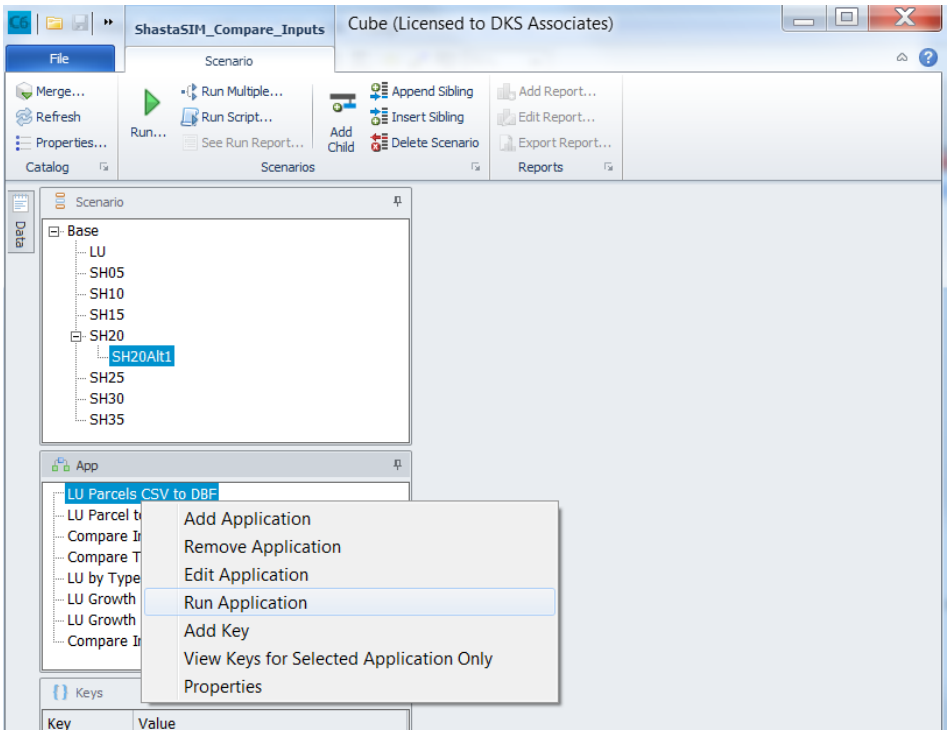
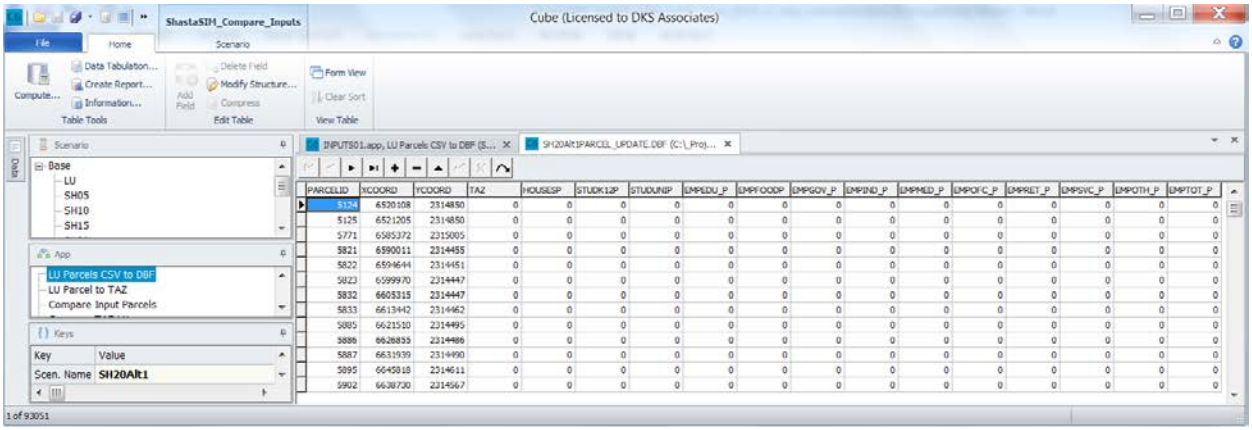
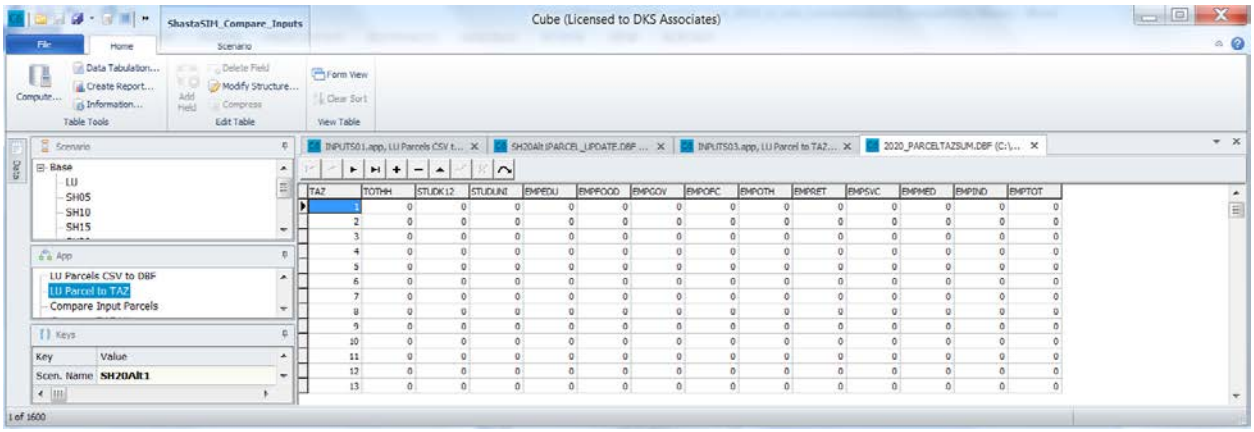


Figure 34: Parcel_Update File Fields



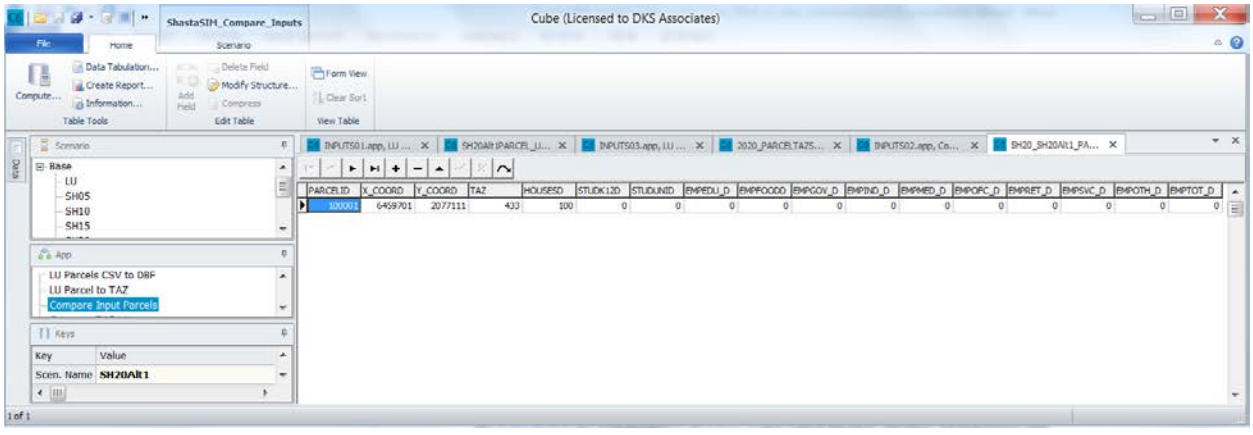
LU Parcel to TAZ: This module takes the .DBF file from the previous module and aggregates the households, students, and employment to traffic analysis zones (TAZs). The resultant .DBF file is located in the COMPARE\LU directory and is called **{SCENARIO_CODE}_PARCELTAZSUM.DBF**.

Figure 35: TAZSUM File Fields



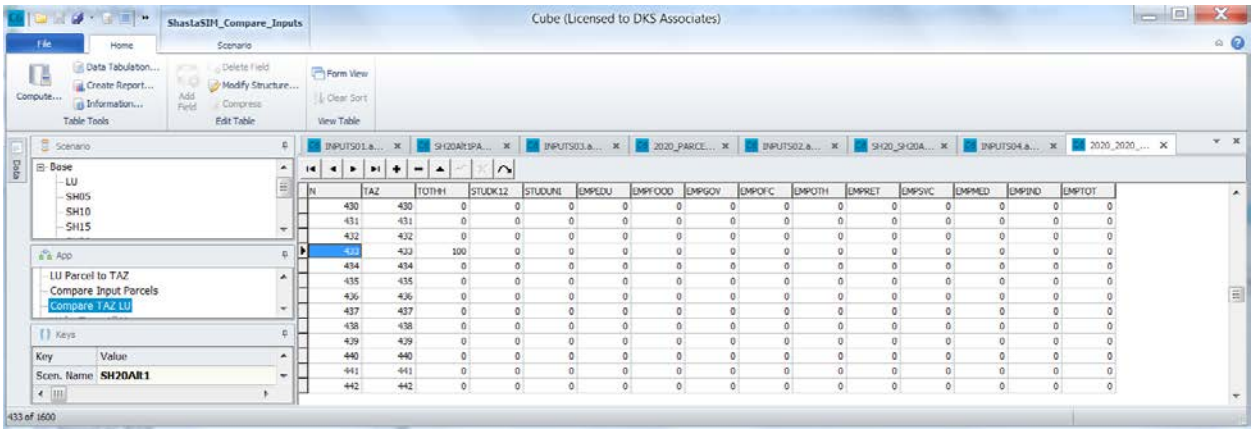
Compare Input Parcels: This module compares the land use inputs for two scenarios. YEAR1 is the later year or ""plus project"" scenario, while YEAR2 is the earlier year or ""no project"" scenario. Currently the scenarios are set up so that each YEAR1 is compared to the base 2010 scenario (YEAR2), but YEAR2 can be changed (using Keys). For instance instead of comparing 2025 to 2010, the user can set it to compare 2025 to 2020. Only changed (or added) parcels are included in the resultant .DBF file ({**YEAR2}_{YEAR1}_TAZGROWTH.DBF**) in the COMPARE\LU directory.

Figure 36: Compare Parcels File Fields



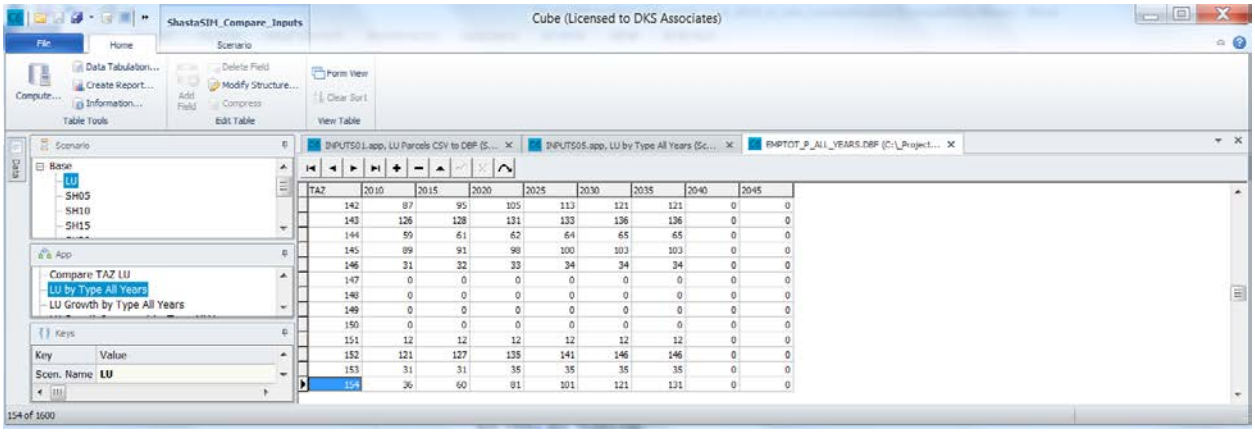
Compare TAZ LU: This module compares the land use totals by TAZ for two scenarios. Similar to the previous module, this one can be set up to compare future scenarios to the 2010 scenario or to other scenarios. It can also be set up to compare a "plus project" to a "no project" scenario. The resultant .DBF file is located in the COMPARE\LU directory and is called **{YEAR2}_{YEAR1}_TAZGROWTH.DBF**.

Figure 37: Compare TAZ File Fields



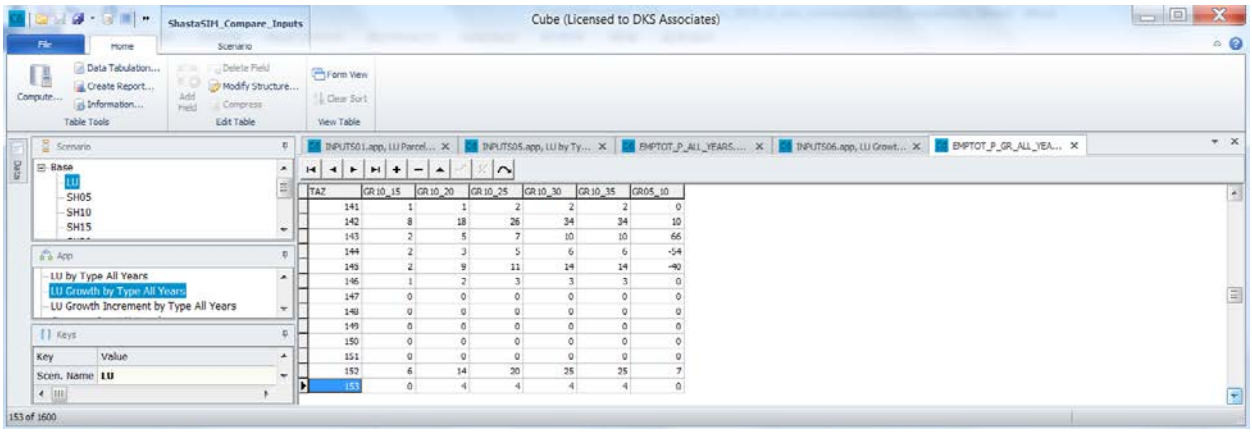
LU Growth by Type All Years: This module creates a .DBF file showing land use for all 5 year increments (2010-2035) for a selected land use category (households, students, each employment category). This module is only run for the "LU" scenario and the desired land use category is a Key that can be selected by drop down menu. The resultant .DBF file is located in the COMPARE\LU directory and is called **{LU_TYPE}_ALL_YEARS.DBF**.

Figure 38: All Years by Type File Fields



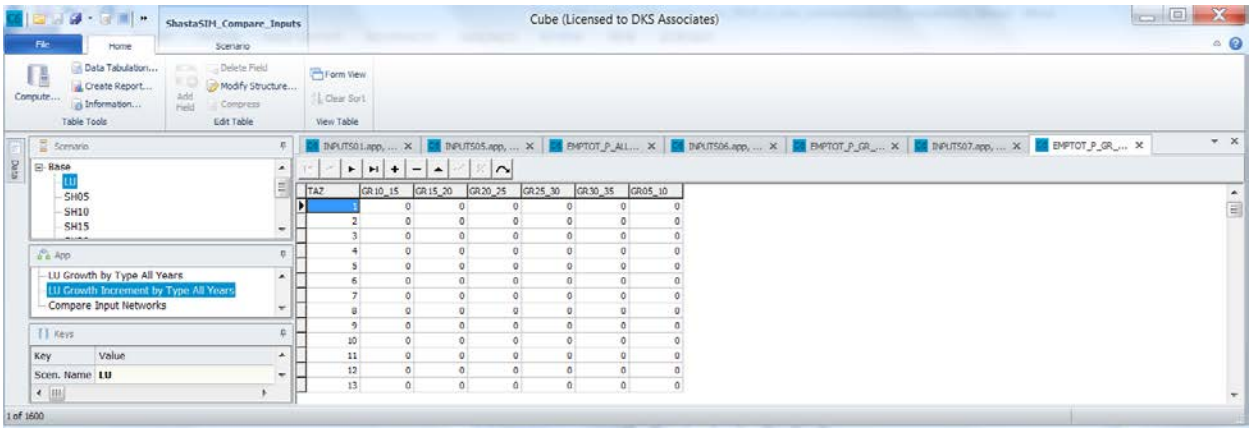
LU Growth by Type All Years: This module is similar to the previous one but the resultant .DBF file includes growth between 2010 and each other year. The resultant .DBF file is located in the COMPARE\LU directory and is called **{LU_TYPE}_GR_ALL_YEARS.DBF**.

Figure 39: All Years Growth by Type File Fields



LU Growth Increment by Type All Years: This module is similar to the previous one but the resultant .DBF file includes incremental 5 year growth between each future year. The resultant .DBF file is located in the COMPARE\LU directory and is called **{LU_TYPE}_GR_INCR_ALL_YEARS.DBF**.

Figure 40: Growth Increment by Type File Fields



Compare Input Networks: This module compares the input roadway networks for two scenarios. Input base networks are located in each scenario directory. The resultant comparison network is located in the COMPARE\NETWORKS directory and is called **{YEAR1}_{YEAR2}COMP.NET**. From the application manager, the comparison network can be opened by double clicking on the output network box. A .VPR file exists in the COMPARE\NETWORKS directory that allows users to easily display and print network comparisons for each resultant network. Color schemes included in the .VPR file include change in lanes, change in speed, and change in facility class. They also show new added links and removed links.

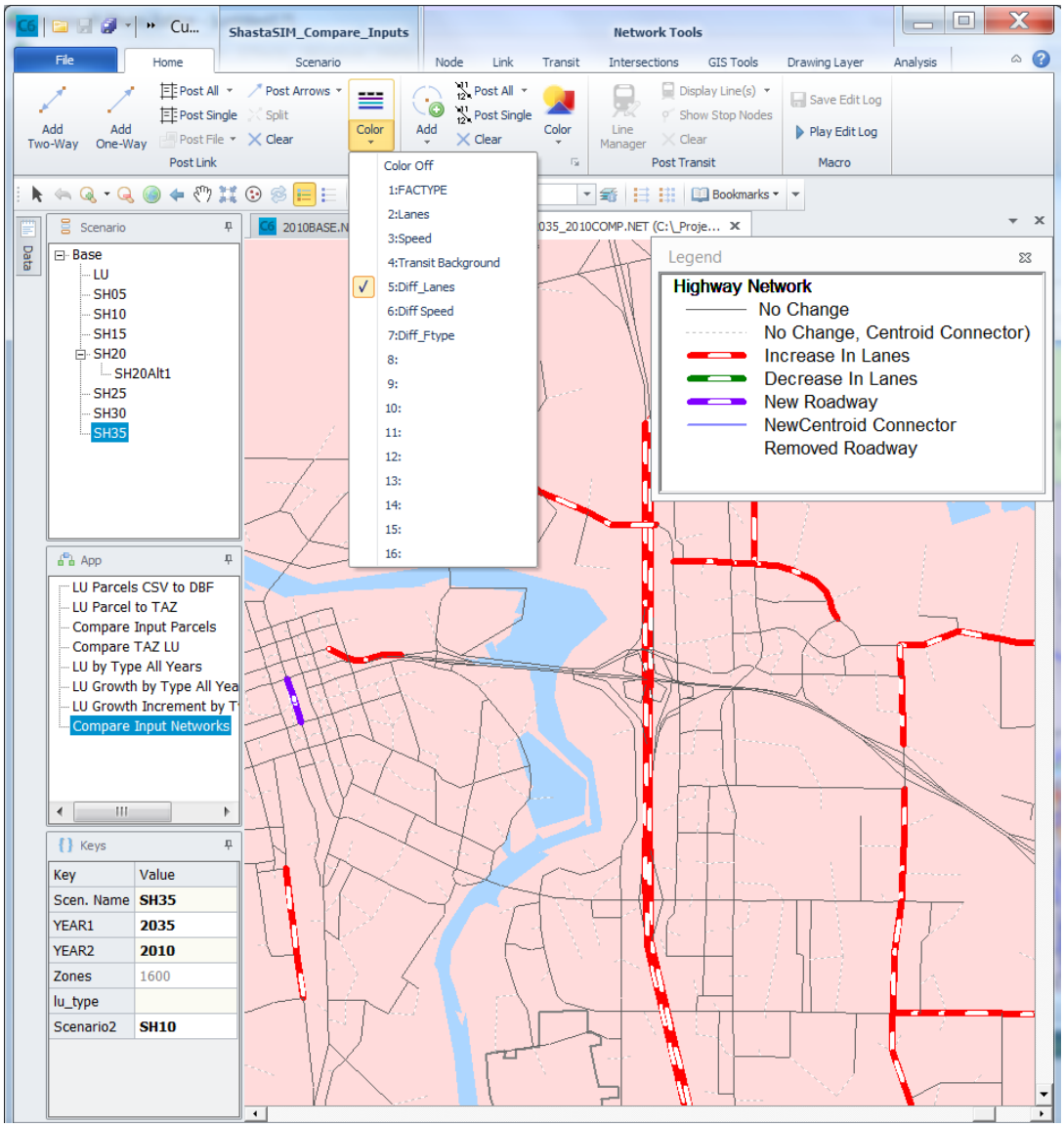
The following Keys are used in the Model Inputs application:

- {YEAR1} – The "future" scenario of interest. For example, if comparing a 2030 to a 2010, {YEAR1} would be 2030.
- {YEAR2} – The "base" scenario. For example, if all future scenarios are compared back to 2010, then {YEAR2} would be 2010.
- {Zones} – The number of zones in the model network. Default is set to 1600.
- {lu_type} – For the three modules that compare all years, choose the land use category of interest using {lu_type}. ***Users should be aware that to see the results of all land uses for the three "land use by type" modules, multiple runs would have to take place, one for each land use.***
- {Scenario2} – Folder name of "base" scenario. Typically "SH10"

Check Network TAZ Connectivity (new for ShastaSIM v1.1): Since the model will not automatically crash if TAZs with land use are not properly connected to the highway network (with centroid connectors) and model results could be incorrect, this module checks to see if any TAZs are disconnected. Once run, a file called **ZONESNOACCESS.TXT** is created. If the text file contains no TAZ numbers, then all TAZs are properly connected to the network. If any TAZ numbers are listed, then the base network should be edited to add centroid connectors for the listed TAZ nodes.

The zone connectivity module should be run before the model is run. This ensures the TAZs and network is connected and eliminates having to rerun the model.

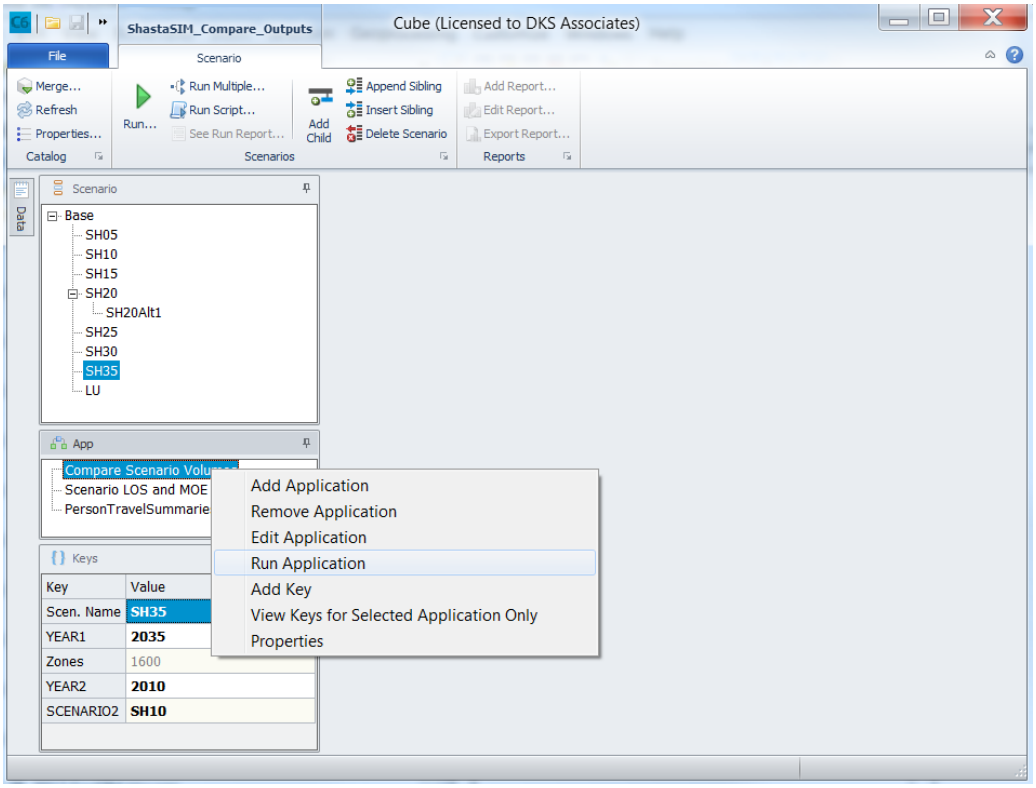
Figure 41: Compare Input Networks (Lanes)



Compare Outputs Catalog

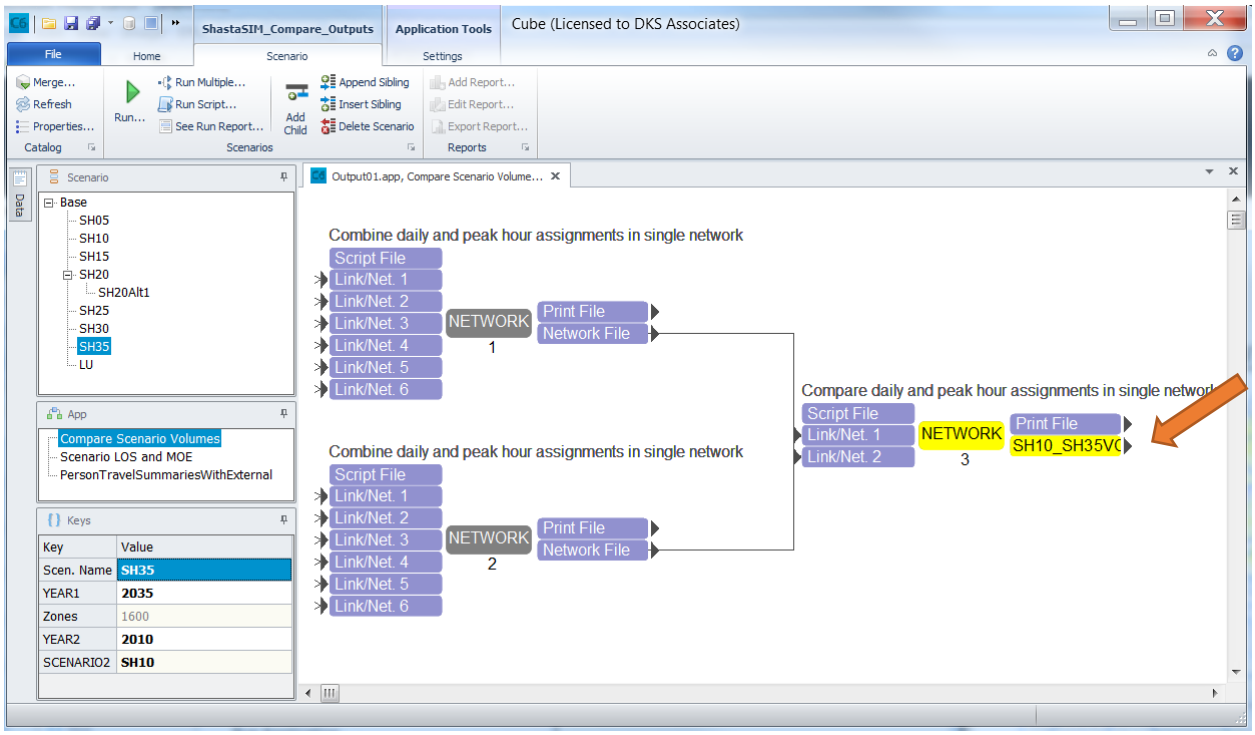
The **SHASTASIM_COMPARE_OUTPUTS.CAT** can be opened in CUBE using the same methods described on **page 14**. Opening the catalog provides a list of available applications to choose from in the Application Pane. Any of these applications can be run by right-clicking on them to bring up the Run Catalog window.

Figure 42: Compare Outputs Catalog



Compare Scenario Volumes: This module compares the loaded peak hour and daily networks for two scenarios. Input base networks are located in each scenario directory. The resultant comparison network is located in the COMPARE\DELTA directory and is called **{YEAR1}_{YEAR2}VOLD.NET**. From the application manager, the comparison network can be opened by double clicking on the output network box.

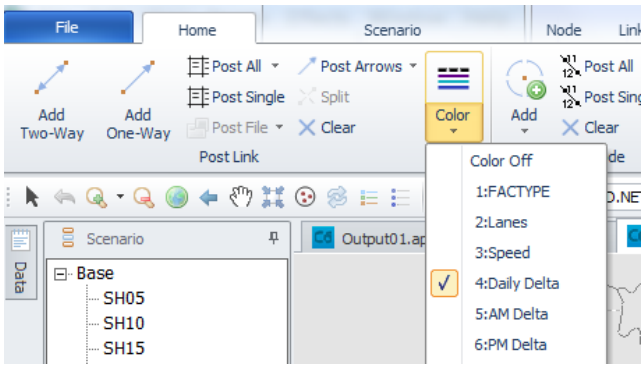
Figure 43: Compare Scenario Volumes Application



A .VPR file exists in the COMPARE\OUTPUT\DELTA directory that allows users to easily display and print network comparisons for each resultant network. Volume changes are colored red for volume increases, green for volume decreases, and blue for new links. Bandwidths are also included to visually display the magnitude of volume changes between scenarios. Opening the **20xxVOLD.NET** shows a network that is color coded by daily two-way model deltas. Color coding can be changed between daily, AM and PM peak by clicking 

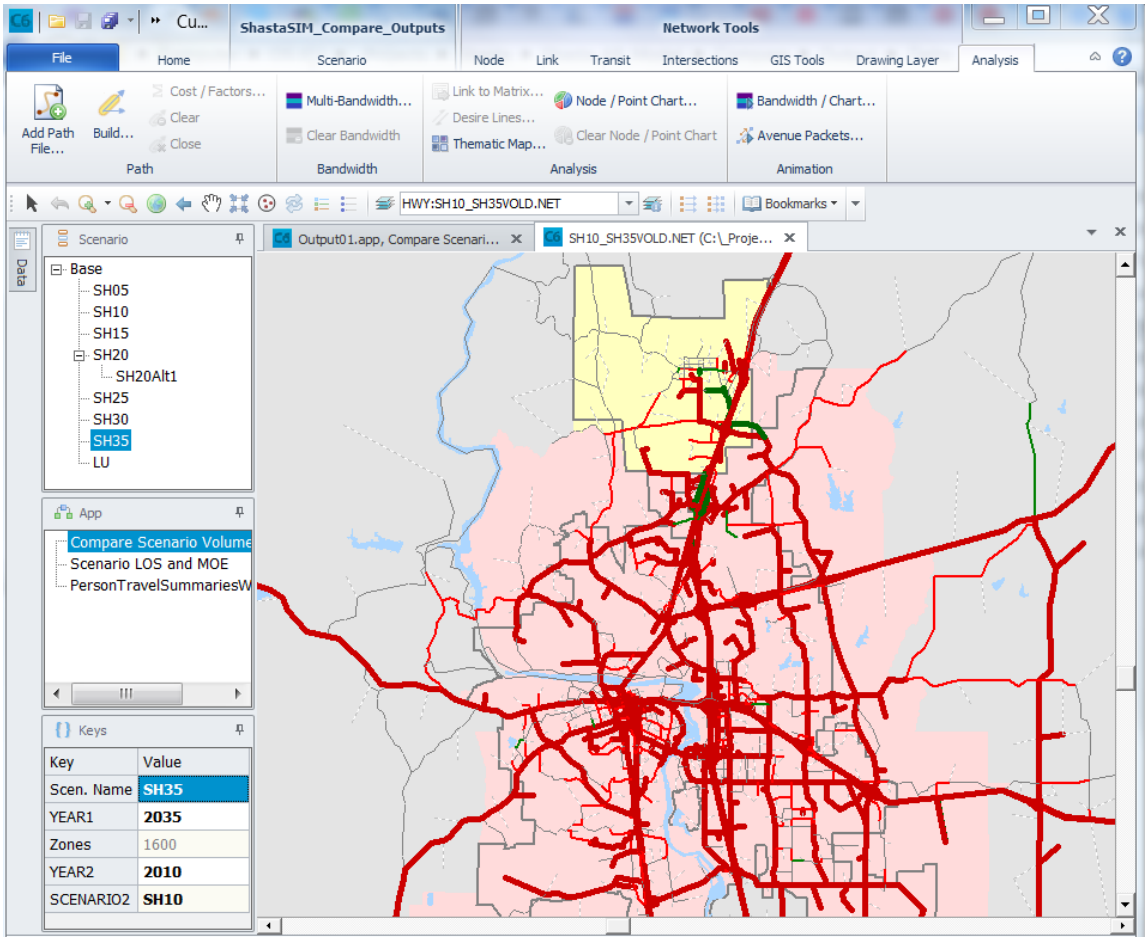
under the HOME tab, as shown in **Figure 44**.

Figure 44: CUBE Color Setting Choice



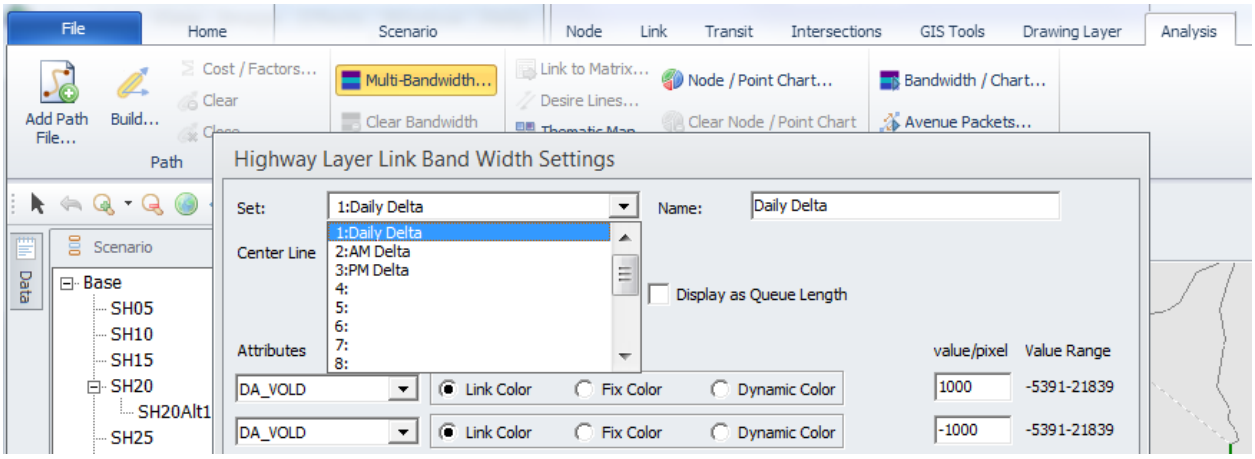
The network will be color coded by the daily volume "delta." Volume increases are red, volume decreases are green, and links with minimal volume change (less than 100 daily or 10 peak hour trips) are grey.

Figure 45: Compare Scenario Volumes Network View



To create a bandwidth map showing the magnitude of change for all links, click on the ANALYSIS tab and on the MULTI BANDWIDTH button. Then the Bandwidth settings window (**Figure 46**) opens.

Figure 46: Bandwidth Settings



This window (see above) offers the choice of daily, AM peak, or PM peak bandwidth. It is important to make sure that the same bandwidth (daily, AM, or PM) is selected as the color setting.

Scenario LOS and MOE

Scenario LOS: This module **(Figure 47)** calculates estimated peak hour level of service (LOS) for model roadway segments. The calculations are the same formulas used by SRTA in previous models. The resultant LOS network is located in the COMPARE\OUTPUT\LOS directory and is called **20xx_LOS.NET**. From the application manager, the LOS network can be opened by double clicking on the output network box. **Figure 47** shows a final screenshot of daily volume change from 2010 to 2035.

Figure 47: Compare Scenario Volumes Bandwidth View

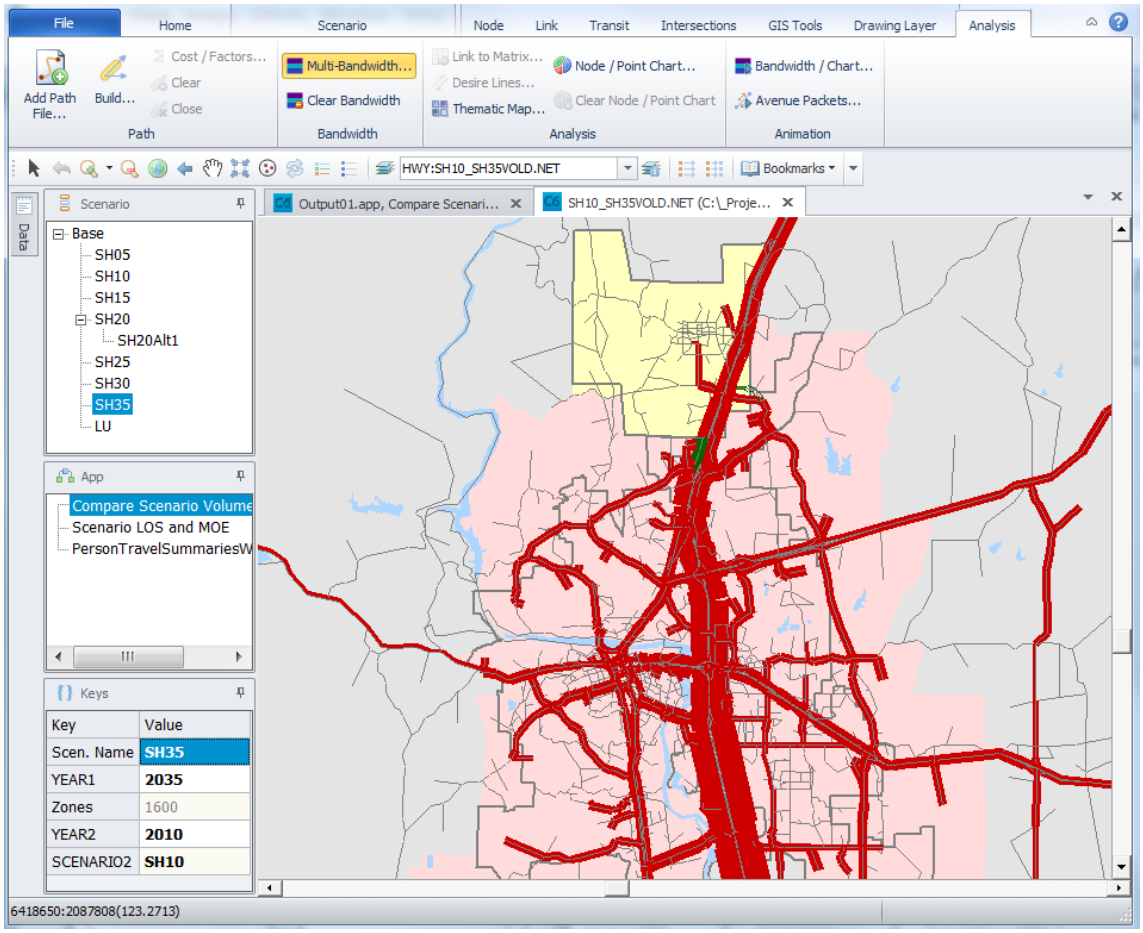
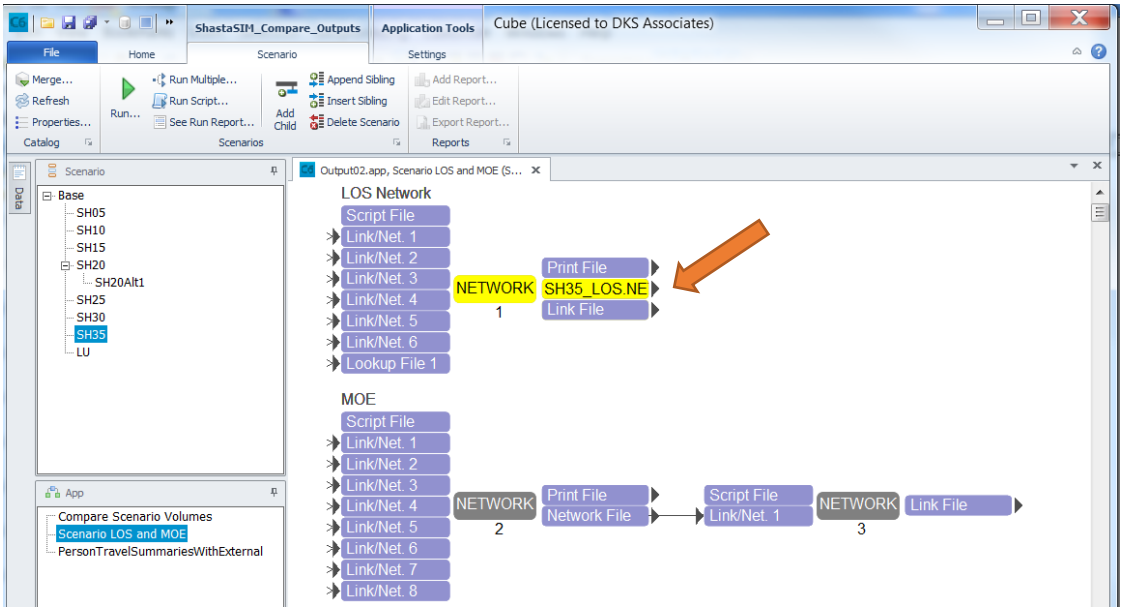
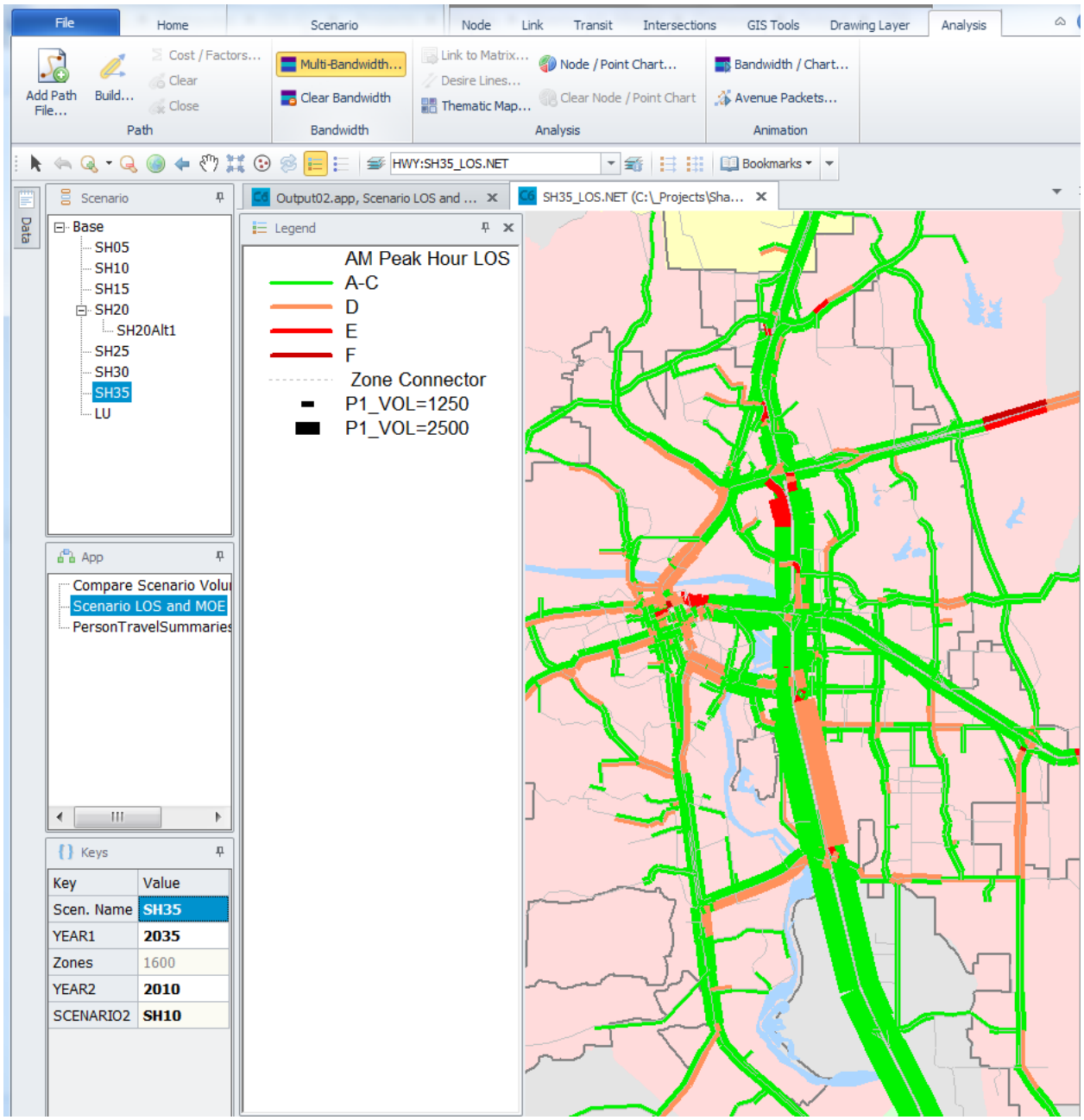


Figure 48: Scenario LOS and MOE Application



A .VPR file exists in the COMPARE\OUTPUT\LOS directory that allows users to easily display and print LOS for each resultant network. Bandwidth settings are also included to visually display the magnitude of volume for each scenario. The method for displaying the correct color coding and bandwidth are the same as discussed above for the volume comparisons. The legend shown in **Figure 49** (page 63) can be opened by clicking . Once the legend is visible on the map, click to keep it from disappearing.

Figure 49: Scenario LOS Network View



Measures of Effectiveness (MOEs): A number of basic MOE's are also created with this application. These MOE's are unique to the activity based model and were not possible with the four step model. MOE's calculated with this application include household vehicle travel distance and time, and household VMT. Files created in the scenario directory include the following.

- Vehicle travel distance and time per trip (by household). Fields in these three files include SAMPN (household number), MODE (travel modes used: 1=drive-transit-walk, 2=walk-transit-drive, 3=Walk-transit-walk, 4=School bus, 5=Shared ride 3+, 6=Shared ride 2, 7=Drive alone, 8=Bike, 9=walk), DIST (distance in miles per trip), TIME (time in minutes per trip), and EXPFAC (conversion factor between person trips and vehicle trips).
    - **A1.VEH.DBF**
    - **P1.VEH.DBF**
    - **DAY.VEH.DBF**
- Daily vehicle VMT (TAZ as origin and destination). Fields in this file include TAZ, VT_O (vehicle trips with TAZ as origin), VT_D (vehicle trips with TAZ as destination), VMT_O (VMT with TAZ as origin), VMT_D (VMT with TAZ as destination).
    - **VEH_VMT.CSV**

Person Travel Summaries With External: This module first aggregates all trip records to each person in the region. This allows all trips by people in a household to be attributed to the correct household, even if the trip did not originate or terminate at the household (such as lunch trips during the work day). Next, the application aggregates the household data to the appropriate TAZ, which in turn allows easy aggregation to each jurisdiction boundary in the model. These processes apply to trips where both trip-ends take place within Shasta County or any of its jurisdictions. Therefore internal-external (IX) trips and external-internal (XI) trips (which are not calculated with the same level of detail as internal trips) need to be counted as well. The IX and XI trips are combined with the TAZ level data to form a more complete dataset. Files created in the scenario directory include the following.

- Data per TAZ
    - **HH_POP.CSV** (households, persons, employment, workers in households)
    - **20xx_TAZ_SUM.DBF** (households, persons, person trips, vehicle trips, VMT, VHT, VMT per person, VMT per household, IX/XI person trips, IX/XI vehicle trips, IX/XI VMT, IX/XI VHT,)
- Data per person
    - **PERSONTRIPSUMS.DBF** (# of trips, # of vehicle trips, personal VMT, personal

VHT)

- Data per jurisdiction
    - **PERS_JURIS_SUM.TXT** (# of households, # of persons, # of person trips, # of vehicle trips, total VMT, total VHT)

The following Keys are used in the Model Outputs application:

- {YEAR1} – The "future" scenario of interest. For example, if comparing a 2030 to a 2010, {YEAR1} would be 2030.
- {YEAR2} – The "base" scenario. For example, if all future scenarios are compared back to 2010, then {YEAR2} would be 2010.
- {Zones} – The number of zones in the model network. Default is set to 1600.
- {Scenario2} – Folder name of "base" scenario. Typically "SH10" if comparing back to 2010, however if the user is doing a ""plus project"" scenario, {Senario2} will likely be the parent folder under which the child scenario is located (though not always).

Scenario Intrazonal VMT and VMT By Speed Bin: This module calculates and summarizes VMT by speed bin as required by California Senate Bill 375 (SB 375). Two files are created within the COMPARE\OUTPUT\VMT\ directory. **SHXX_IZ_VMT.CSV** summarizes intrazonal VMT (VMT that remains within each TAZ) by speed bin. **SHXXVMT_SPEEDBIN.CSV** summarizes other VMT (internal VMT between different TAZs, internal-external, and external-internal) by speed bin, categorized as urban streets and freeways.

VMT Per Capita SACOG: This module has been added to ShastaSIM 1.1 and uses SACOG's methodology to calculate VMT per capita. Key outputs of this module include:

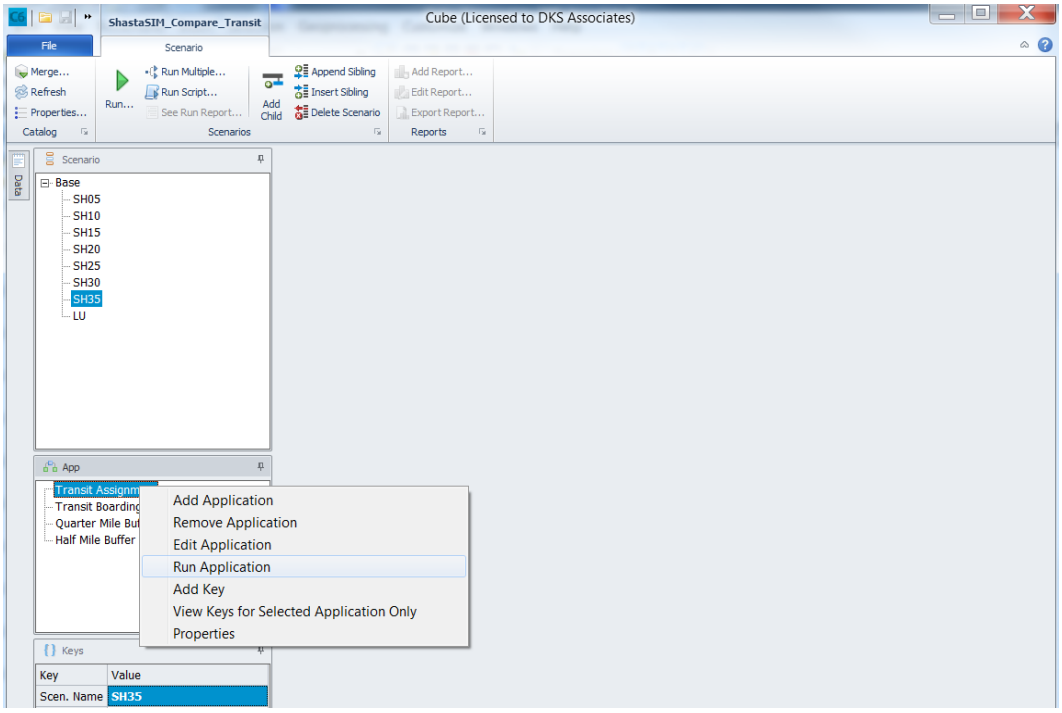
- **PERSTRIPSUMS.DBF**: includes household location, person trips, vehicle trips, and VMT and VHT per person residing in the county.
- **II_TAZ.DBF**: includes households and population totals, as well as all internal (trips begin and end in Shasta County) person trips, vehicle trips, VMT and VHT summarized by TAZ.
- **IXXI_TAZ.DBF**: includes internal-external (IX) and external-internal (XI) trips, summarized by TAZ.
- **CV_SGA.CSV**: includes commercial vehicle VMT, summarized by origin and destination for each jurisdiction and Strategic Growth Area (SGA).
- **EXT_SGA.CSV**: includes internal-external (IX) and external-internal (XI) VMT, summarized by origin and destination for each jurisdiction and SGA.
- **CV_SGA_TRIPS.CSV**: includes commercial vehicle trips, summarized by origin and destination for each jurisdiction and SGA, and excludes VMT on gateway connectors outside Shasta County.
- **EXT_SGA_TRIPS.CSV**: includes internal-external (IX) and external-internal (XI) trips,

summarized by origin and destination for each jurisdiction and SGA, and excludes VMT on gateway connectors outside Shasta County.

Compare Transit Application

The **SHASTASIM_COMPARE_TRANSIT.CAT** can be opened in CUBE using the same methods described on **page 14**. Opening the catalog provides a list of available applications to choose from in the Application Pane. Any of these applications can be run by right-clicking on them to bring up the Run Catalog window.

Figure 50: Compare Transit Application



Transit Assignment: This module runs the transit assignment for the current scenario and prepares all files needed for the modules that follow it, including **line boardings**, which are located in the scenario directory. This module does not create any files in the COMPARE directory; however it creates four new .CSV files and two new .DBF files in the Scenario directory. In the following outputs, walk access refers to a trip where the transit user walks from their origin to the bus stop. Drive access refers to a trip where a person takes a vehicle (either drives or is dropped off) to the bus stop.

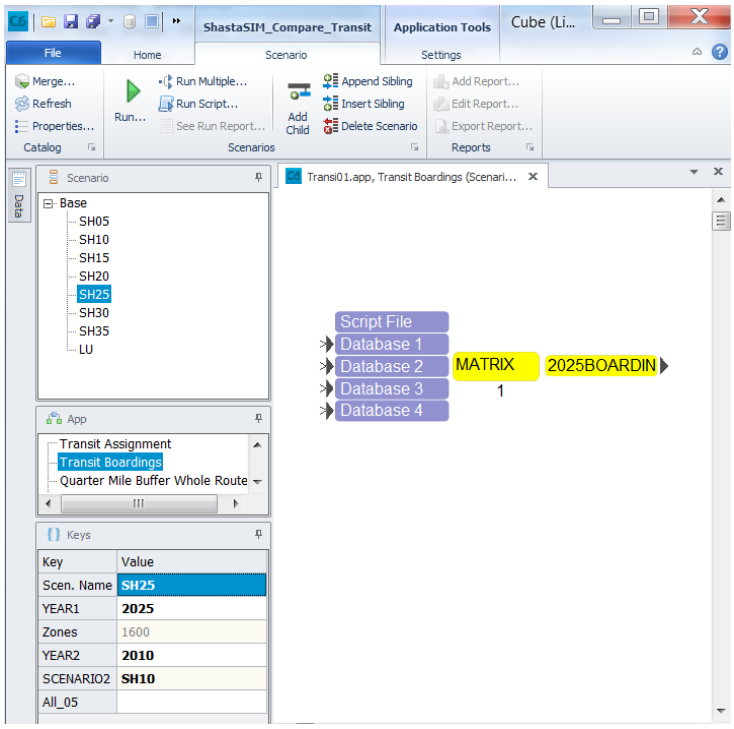
- Generalized Transit Loading Data by Route (one row per route direction)
  - **20xxLVPW.CSV** (walk-access transit loadings, peak period)
  - **20xxLVPD.CSV** (drive-access transit loadings, peak period)

- **20xxLVOW.CSV** (walk-access transit loadings, off peak)
- **20xxLVOD.CSV** (drive-access transit loadings, off peak)

- Detailed Transit Boarding Data by Route (many rows per route per direction)
  - **20xxTRPKWK.DBF** (walk-access transit boardings, peak period)
  - **20xxTRPKDR.DBF** (drive-access transit boardings, peak period)
  - **20xxTROPWK.DBF** (walk-access transit boardings, off peak)
  - **20xxTROPDR.DBF** (drive-access transit boardings, off peak)

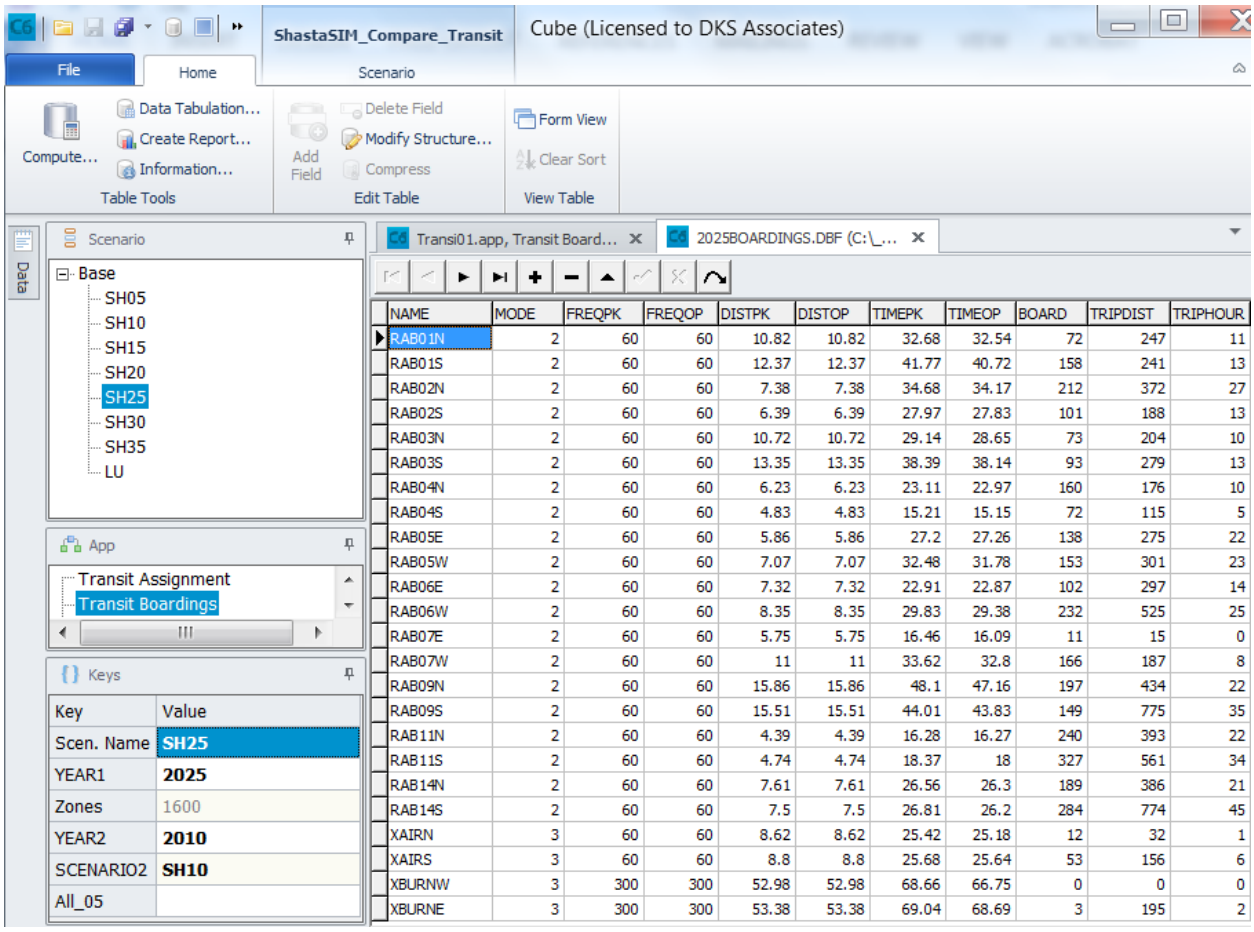
Transit Boardings: This module compiles all boardings for each transit route for a single scenario, including "peak hour" walk and drive boardings and "off-peak" walk and drive boardings. The resultant .DBF file is located in the COMPARE\TRANSIT directory and is called **20xx_BOARDINGS.DBF**. For a comparison of boardings between scenarios, individual .DBF files can be copied into sheets in an Excel spreadsheet for review. The boardings file can be opened by double clicking on the appropriate box in the **Transit Boardings** application (See **Figure 51**).

Figure 51: Compare Transit Boardings Application



The resultant boardings file has the following fields: MODE (mode 2 = bus), FREQPK (peak frequency in minutes), FREQOP (off peak frequency in minutes), DISTPK and DISTOP (route distance in miles), TIMEPK and TIMEOP (route travel time in minutes), BOARD (total route daily boardings), TRIPDIST (total distance traveled by riders), and TRIPHOUR (total hours traveled by riders).

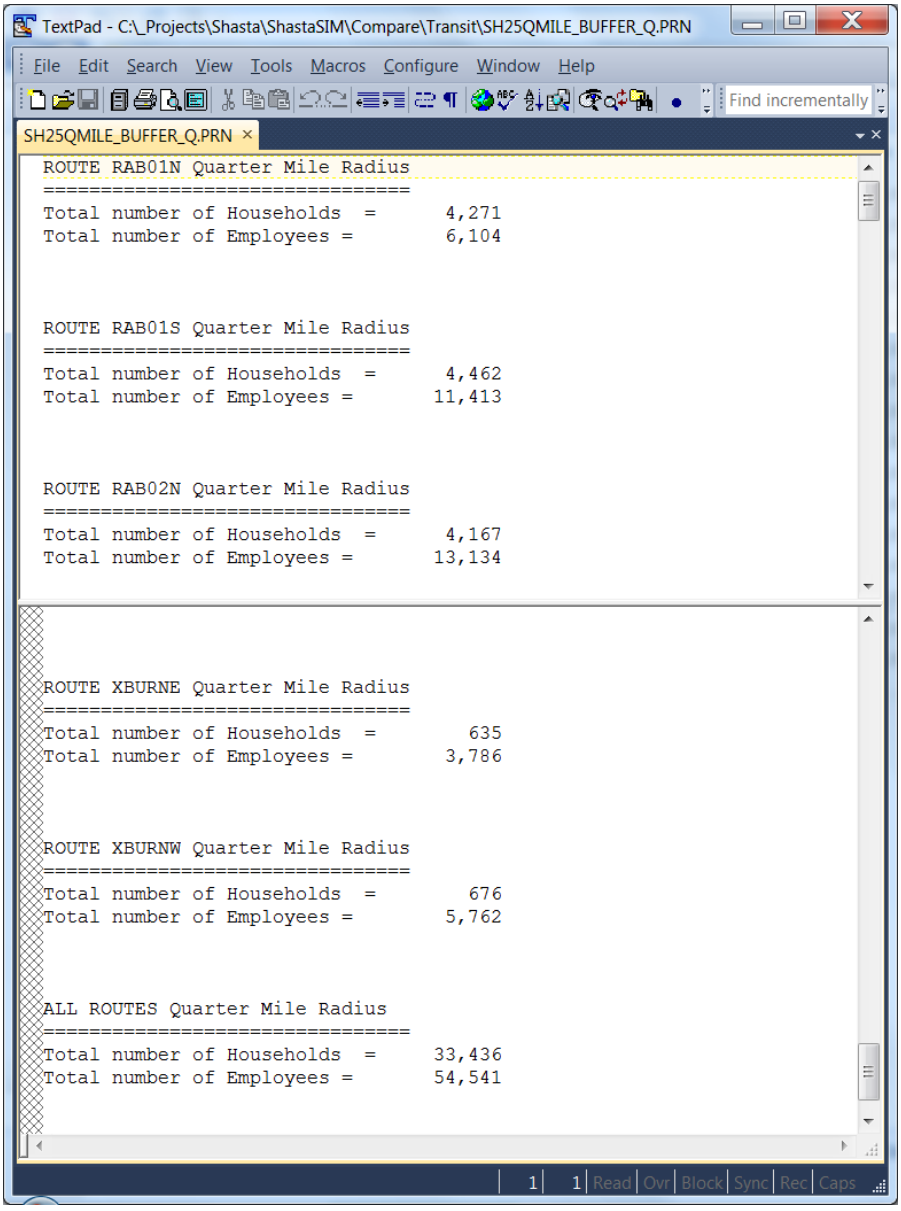
Figure 52: Compare Transit Boardings Output



Transit Stops: This module creates transit stop and transit link DBF files in unique scenario directories below the COMPARE\TRANSIT\ directory. These files are created in order to support the following two buffering modules.

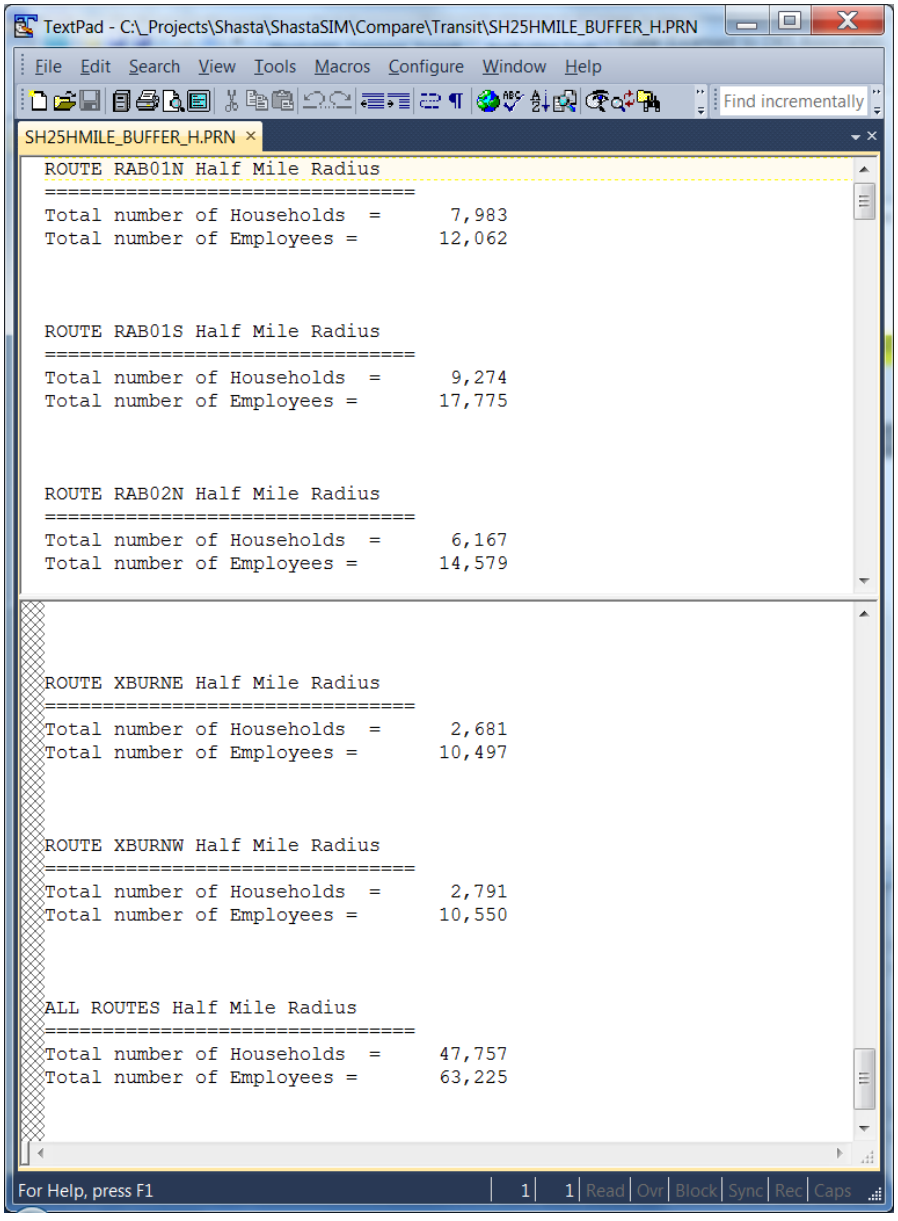
Buffer Transit Quarter Mile: This module calculates the number of households and employees within a ¼ mile radius of the stops of each transit route. Households and employment within ¼ mile of more than one stop are not double counted. Resultant text .PRN files are created for each transit route and then all files are copied into one .PRN file for the scenario. Individual .PRN files are then deleted after the overall file is created. The resultant file is called **20xxQMILE_BUFFER_Q.PRN** and is located in the COMPARE\TRANSIT directory. A sample of the beginning and end of the SH25 file is shown below.

Figure 53: Households & Employment Within ¼ Mile of Transit Stop Output



Buffer Transit Half Mile: This module calculates the number of households and employees within a ½ mile radius of the stops of each transit route. Households and employment within ½ mile of more than one stop are not double counted. Resultant text .PRN files are created for each transit route and then all files are copied into one .PRN file for the scenario. Individual .PRN files are then deleted after the overall file is created. The resultant file is called **20xxHMILE_BUFFER_H.PRN** and is located in the COMPARE\TRANSIT directory. A sample of the beginning and end of the SH25 file is shown below.

Figure 54: Households & Employment Within ½ Mile of Transit Stop Output



The following Keys are used in the Compare Transit application:

- {YEAR1} – The "future" scenario of interest. For example, if comparing a 2030 to a 2010, {YEAR1} would be 2030.
- {YEAR2} – The "base" scenario. For example, if all future scenarios are compared back to 2010, then {YEAR2} would be 2010.
- {Zones} – The number of zones in the model network. Default is set to 1600.
- {Scenario2} – Folder name of "base" scenario. Typically "SH10" if comparing back to 2010.

9. SUMMARIZATION OF MOE RESULTS

A large spreadsheet (**MOE_BASE.XLS** in the MOE directory) has been created to consolidate and summarize all of the MOE data described above. The spreadsheet has a data sheet for each base scenario (SH05, SH10, SH13, SH15, SH20, SH25, SH30, and SH35) where the following data must be pasted into the correct cells for the data to be summarized:

- **20xx_VOL.DBF**: CELL D2
- **20xxBOARDINGS.DBF**: CELL CA2
- **HH_POP.CSV**: CELL CM2
- **VEH_VMT.CSV**: CELL CU2
- **20xxPERS_TAZ_SUM.DBF**: CELL DC2
- **20xxHMILE_BUFFER_H.PRN**: CELL CA30
- **20xxQMILE_BUFFER_Q.PRN**: CELL CD30

The resultant summary data includes all of the data in Chapter 9 of the *ShastaSIM Model Development Report* (DKS Associates, 2014), as well as additional detailed data. The **MOE_BASE.XLS** spreadsheet includes three summary sheets (Pop HH VMT Summary, Roadway Summary, and Transit Summary), screenshots of which are shown in **Figure 55** to **Figure 60**. Each year also has a roadway system MOE sheet called MEAS_SHXX, a screenshot of which is shown in **Figure 61**.

A second MOE table centered on VMT has been created with the model update. This spreadsheet (**VMT_SUMMARIES_COMPARISON.XLSX)** includes detailed VMT summaries based on SACOG's methodology of calculating VMT per capita. The methodology calculates not only total VMT per capita, but also VMT per capita consistent with SB 375, which excludes through trips (XX) that do not begin or end within the County. The methodology also separates VMT attributed to households within the County from VMT not attributed to households within the County. This table is shown in **Figure 63**; which spans multiple pages.

A third MOE table summarizes VMT by speed bin for use in the EMFAC greenhouse gas software package. This spreadsheet (**EMFAC_SPEED_BINS_SRTA_SB375.XLSX**) summarizes network based VMT by 5 mile-per-hour congested speed increments. This table is shown in **Figure 63**.

Figure 55: MOE_BASE.XLS Population and Households Summary

Shasta County Activity Based Model: Population, Households, and VMT Summary

Population	2005	2010	2015	2020	2025	2030	2035
Shasta County Total	174,495	176,465	182,261	191,905	199,977	207,448	214,830
Redding	89,936	91,182	95,570	102,978	105,970	108,226	113,340
Anderson	9,767	9,877	10,523	11,319	12,972	12,953	13,584
Shasta Lake	10,040	10,125	9,936	10,360	10,711	11,229	11,280
Unincorporated County	64,752	65,281	66,232	67,248	70,324	75,040	76,626

Households	2005	2010	2015	2020	2025	2030	2035
Shasta County Total	70,343	71,151	73,471	77,283	80,588	83,636	86,534
Redding	36,170	36,789	38,613	41,440	42,871	43,834	45,498
Anderson	3,926	3,987	4,204	4,535	5,274	5,265	5,338
Shasta Lake	3,993	4,008	4,034	4,073	4,292	4,534	4,583
Unincorporated County	26,254	26,367	26,620	27,235	28,151	30,003	31,115

Population Growth	2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035
Shasta County Total		1,970	5,796	9,644	8,072	7,471	7,382
Redding		1,246	4,388	7,408	2,992	2,256	5,114
Anderson		110	646	796	1,653	-19	631
Shasta Lake		85	-189	424	351	518	51
Unincorporated County		529	951	1,016	3,076	4,716	1,586

Households Growth	2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035
Shasta County Total		808	2,320	3,812	3,305	3,048	2,898
Redding		619	1,824	2,827	1,431	963	1,664
Anderson		61	217	331	739	-9	73
Shasta Lake		15	26	39	219	242	49
Unincorporated County		113	253	615	916	1,852	1,112

Average Population Per Household	2005	2010	2015	2020	2025	2030	2035
Shasta County Total	2.48	2.48	2.48	2.48	2.48	2.48	2.48
Redding	2.49	2.48	2.48	2.48	2.47	2.47	2.49
Anderson	2.49	2.48	2.50	2.50	2.46	2.46	2.54
Shasta Lake	2.51	2.53	2.46	2.54	2.50	2.48	2.46
Unincorporated County	2.47	2.48	2.49	2.47	2.50	2.50	2.46

Figure 56: MOE_BASE.XLS VMT Summary

VMT Attributed to Households	2005	2010	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)							
Shasta County Total	3,011,156	2,820,726	2,939,217	2,842,607	2,967,483	3,049,471	3,156,640
Redding	984,295	985,397	1,065,888	1,105,927	1,154,399	1,161,467	1,220,369
Anderson	136,081	135,460	142,672	145,059	170,705	170,350	178,070
Shasta Lake	149,909	149,326	149,110	140,675	149,884	154,864	158,375
Unincorporated County	1,740,870	1,550,542	1,581,547	1,450,946	1,492,495	1,562,790	1,599,826
To/From Outside Shasta County (I-X and X-I)							
Shasta County Total	496,680	530,342	596,635	677,560	755,629	830,152	911,626
Redding	293,927	259,795	301,207	348,837	386,960	419,061	462,276
Anderson	22,707	29,120	33,632	39,342	48,297	51,380	56,340
Shasta Lake	33,389	28,603	31,056	34,539	38,978	43,698	47,229
Unincorporated County	146,657	212,824	230,740	254,841	281,394	316,013	345,781
All VMT							
Shasta County Total	3,507,836	3,351,067	3,535,852	3,520,167	3,723,112	3,879,623	4,068,266
Redding	1,278,222	1,245,193	1,367,095	1,454,763	1,541,360	1,580,528	1,682,646
Anderson	158,788	164,580	176,304	184,401	219,002	221,730	234,410
Shasta Lake	183,299	177,928	180,166	175,215	188,862	198,562	205,604
Unincorporated County	1,887,527	1,763,366	1,812,287	1,705,788	1,773,889	1,878,803	1,945,607

VMT Per Capita	2005	2010	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)							
Shasta County Total	17.26	15.98	16.13	14.81	14.84	14.70	14.69
Redding	10.94	10.81	11.15	10.74	10.89	10.73	10.77
Anderson	13.93	13.71	13.56	12.82	13.16	13.15	13.11
Shasta Lake	14.93	14.75	15.01	13.58	13.99	13.79	14.04
Unincorporated County	26.89	23.75	23.88	21.58	21.22	20.83	20.88
To/From Outside Shasta County (I-X and X-I)							
Shasta County Total	2.85	3.01	3.27	3.53	3.78	4.00	4.24
Redding	3.27	2.85	3.15	3.39	3.65	3.87	4.08
Anderson	2.32	2.95	3.20	3.48	3.72	3.97	4.15
Shasta Lake	3.33	2.82	3.13	3.33	3.64	3.89	4.19
Unincorporated County	2.26	3.26	3.48	3.79	4.00	4.21	4.51
All VMT Per Capita							
Shasta County Total	20.10	18.99	19.40	18.34	18.62	18.70	18.94
Redding	14.21	13.66	14.30	14.13	14.55	14.60	14.85
Anderson	16.26	16.66	16.75	16.29	16.88	17.12	17.26
Shasta Lake	18.26	17.57	18.13	16.91	17.63	17.68	18.23
Unincorporated County	29.15	27.01	27.36	25.37	25.22	25.04	25.39

VMT Per Household	2005	2010	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)							
Shasta County Total	42.81	39.64	40.01	36.78	36.82	36.46	36.48
Redding	27.21	26.79	27.60	26.69	26.93	26.50	26.82
Anderson	34.66	33.98	33.94	31.99	32.37	32.36	33.36
Shasta Lake	37.54	37.26	36.96	34.54	34.92	34.16	34.56
Unincorporated County	66.31	58.81	59.41	53.28	53.02	52.09	51.42
To/From Outside Shasta County (I-X and X-I)							
Shasta County Total	7.06	7.45	8.12	8.77	9.38	9.93	10.53
Redding	8.13	7.06	7.80	8.42	9.03	9.56	10.16
Anderson	5.78	7.30	8.00	8.68	9.16	9.76	10.55
Shasta Lake	8.36	7.14	7.70	8.48	9.08	9.64	10.31
Unincorporated County	5.59	8.07	8.67	9.36	10.00	10.53	11.11
All VMT Per Household							
Shasta County Total	49.87	47.10	48.13	45.55	46.20	46.39	47.01
Redding	35.34	33.85	35.41	35.11	35.95	36.06	36.98
Anderson	40.45	41.28	41.94	40.66	41.52	42.11	43.91
Shasta Lake	45.91	44.39	44.66	43.02	44.00	43.79	44.86
Unincorporated County	71.89	66.88	68.08	62.63	63.01	62.62	62.53

Figure 57: MOE_BASE.XLS VMT and Trips Summary

Vehicle Trips	2005	2010	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)							
Shasta County Total	432,870	436,149	452,426	464,404	485,851	500,549	520,374
Redding	226,454	229,704	240,856	254,420	263,922	266,174	278,748
Anderson	23,984	24,258	25,327	26,626	30,703	30,865	32,303
Shasta Lake	23,702	23,871	24,322	23,837	25,068	26,319	26,784
Unincorporated County	158,729	158,316	161,921	159,521	166,158	177,192	182,539
To/From Outside Shasta County (I-X and X-I)							
Shasta County Total	15,740	19,113	21,418	24,379	27,417	30,430	33,473
Redding	7,703	7,597	8,785	10,266	11,385	12,268	13,558
Anderson	969	1,894	2,156	2,591	3,210	3,403	3,762
Shasta Lake	781	736	794	888	1,005	1,117	1,212
Unincorporated County	6,287	8,886	9,683	10,634	11,817	13,642	14,941
All Vehicle Trips							
Shasta County Total	448,610	455,262	473,844	488,783	513,268	530,979	553,847
Redding	234,157	237,301	249,641	264,686	275,307	278,442	292,306
Anderson	24,953	26,152	27,483	29,217	33,913	34,268	36,065
Shasta Lake	24,483	24,607	25,116	24,725	26,073	27,436	27,996
Unincorporated County	165,016	167,202	171,604	170,155	177,975	190,834	197,480

Average Trip Length	2005	2010	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)							
Shasta County Total	6.96	6.47	6.50	6.12	6.11	6.09	6.07
Redding	4.35	4.29	4.43	4.35	4.37	4.36	4.38
Anderson	5.67	5.58	5.63	5.45	5.56	5.52	5.51
Shasta Lake	6.32	6.26	6.13	5.90	5.98	5.88	5.91
Unincorporated County	10.97	9.79	9.77	9.10	8.98	8.82	8.76
To/From Outside Shasta County (I-X and X-I)							
Shasta County Total	31.56	27.75	27.86	27.79	27.56	27.28	27.23
Redding	38.16	34.20	34.29	33.98	33.99	34.16	34.10
Anderson	23.43	15.37	15.60	15.18	15.05	15.10	14.98
Shasta Lake	42.75	38.86	39.11	38.90	38.78	39.12	38.97
Unincorporated County	23.33	23.95	23.83	23.96	23.81	23.16	23.14
Total Average Trip Length							
Shasta County Total	7.82	7.36	7.46	7.20	7.25	7.31	7.35
Redding	5.46	5.25	5.48	5.50	5.60	5.68	5.76
Anderson	6.36	6.29	6.42	6.31	6.46	6.47	6.50
Shasta Lake	7.49	7.23	7.17	7.09	7.24	7.24	7.34
Unincorporated County	11.44	10.55	10.56	10.02	9.97	9.85	9.85

Average Daily Trips per Household	2005	2010	2015	2020	2025	2030	2035
Shasta County Total	6.38	6.40	6.45	6.32	6.37	6.35	6.40
Redding	6.47	6.45	6.47	6.39	6.42	6.35	6.42
Anderson	6.36	6.56	6.54	6.44	6.43	6.51	6.76
Shasta Lake	6.13	6.14	6.23	6.07	6.07	6.05	6.11
Unincorporated County	6.29	6.34	6.45	6.25	6.32	6.36	6.35

Figure 58: MOE_BASE.XLS Roadway Summary

Roadway Statistics	VMT, VHD, Miles						
	2005	2010	2015	2020	2025	2030	2035
Total Lane Miles of Roads in Analysis Area	**3,826.7**	**3,840.4**	**3,858.8**	**3,884.8**	**3,899.6**	**3,912.2**	**3,930.7**
5 year increment		13.7	32.1	25.9	14.8	12.6	18.5
Increase vs 2010			32.1	58.1	72.9	85.5	104.0
Daily Vehicle Miles of Travel on Roadways	**4,976,252**	**5,501,460**	**5,916,731**	**6,128,972**	**6,549,914**	**6,924,928**	**7,335,441**
Freeway	1,959,604	2,258,253	2,472,439	2,634,162	2,845,745	3,049,274	3,254,186
Highway	1,020,877	1,176,582	1,261,485	1,263,102	1,350,167	1,419,936	1,496,569
Expressway	209,845	222,473	230,106	231,031	244,811	257,256	271,333
Arterial	990,062	1,013,642	1,076,196	1,105,494	1,165,671	1,212,272	1,272,236
Collector	314,934	328,506	347,445	356,981	380,559	403,386	433,014
Local	86,305	91,618	97,152	100,892	104,469	108,831	113,221
Ramp	104,520	107,651	115,020	119,046	125,528	126,588	133,394
Zone Connector	290,106	302,734	316,888	318,265	332,964	347,387	361,488
Daily Vehicle Hours of Delay	**1,564**	**1,391**	**1,564**	**1,459**	**1,686**	**1,946**	**2,367**
Freeway	18.6	64.7	56.8	48.0	34.3	64.6	103.7
Highway	106.4	110.0	114.6	84.0	104.2	136.3	150.6
Expressway	445.7	215.0	254.2	235.8	276.6	314.5	389.1
Arterial	553.1	510.8	604.8	518.3	589.7	671.4	840.4
Collector	215.3	224.3	249.2	273.6	359.6	402.8	465.8
Local	133.7	149.8	147.7	152.8	156.1	158.3	173.3
Ramp	91.2	116.2	131.5	145.9	165.3	198.4	244.1
Zone Connector	0.0	0.4	5.5	0.1	0.0	0.0	0.0
Miles of Roads at LOS E/F	**12.2**	**8.9**	**9.0**	**7.2**	**8.6**	**13.8**	**9.9**
Freeway	0.9	1.7	0.9	0.9	0.9	6.3	0.9
Highway	2.5	2.5	2.5	2.5	2.5	3.1	2.5
Expressway	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Arterial	3.5	2.5	3.6	1.6	2.3	1.8	3.3
Collector	0.4	0.3	0.3	0.5	0.8	0.9	1.2
Local	0.2	0.2	0.0	0.0	0.4	0.0	0.2
Ramp	1.7	1.7	1.7	1.7	1.7	1.7	1.9
Zone Connector	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 59: MOE_BASE.XLS Transit Boardings Summary

Countywide Transit Statistics	2005	2010	2015	2020	2025	2030	2035
Total System Daily Transit Boardings	**2,482**	**2,925**	**2,993**	**3,822**	**3,198**	**6,173**	**6,414**
Route 1 North	38	79	49	82	85	86	109
Route 1 South	35	175	162	129	166	81	81
Route 2 North	185	223	234	272	221	495	481
Route 2 South	100	99	111	159	114	358	378
Route 3 North	60	64	74	72	75	264	264
Route 3 South	66	95	118	122	95	267	248
Route 4 North	110	131	157	152	154	113	111
Route 4 South	94	43	51	69	75	73	72
Route 5 North	125	123	118	135	117	361	381
Route 5 South	216	133	126	141	147	467	495
Route 6 North	104	100	100	119	113	243	287
Route 6 South	247	230	199	234	241	531	491
Route 7 North	106	19	12	19	20	87	82
Route 7 South	128	144	159	153	167	398	403
Route 8 North	26						
Route 8 South	22						
Route 9 North	169	158	169	152	183	140	145
Route 9 South	104	112	123	170	153	251	242
Route 11 North	197	180	234	310	206	381	464
Route 11 South	47	311	321	547	310	584	593
Route 14 North	54	163	137	260	174	360	388
Route 14 South	248	287	274	450	308	510	579
Airport Express North	0	16	12	12	17	4	12
Airport Express South	0	37	47	51	44	91	87
Burney Express North	0	2	3	4	4	3	4
Burney Express South	1	1	3	8	9	25	17
Cottonwood Express South	0	0	0	5	1	21	16
Cottonwood Express North	0	0	0	2	1	14	22

Total System Daily Transit Boardings	**2,482**	**2,925**	**2,993**	**3,822**	**3,198**	**6,173**	**6,414**
Route 1	73	254	211	211	251	167	190
Route 2	285	322	345	431	335	853	859
Route 3	126	159	192	194	170	531	512
Route 4	204	174	208	221	229	186	183
Route 5	341	256	244	276	264	828	876
Route 6	351	330	299	353	354	774	778
Route 7	234	163	171	172	187	485	485
Route 8	48						
Route 9	273	270	292	322	336	391	387
Route 11	244	491	555	857	516	965	1057
Route 14	302	450	411	710	482	870	967
Airport Express	0	53	59	63	61	95	99
Burney Express	1	3	6	12	13	28	21
Cottonwood Express	0	0	0	7	2	35	38

Figure 60: MOE_BASE.XLS Transit Buffering Summary

Total Households Within 1/2 Mile of Transit Stops	43,329	44,265	42,053	44,644	45,899	46,859	48,340
Route 1 North	5,207	7,425	6,859	7,090	7,372	7,575	7,651
Route 1 South	5,413	8,277	7,788	8,068	8,605	8,895	9,087
Route 2 North	5,993	5,821	5,519	5,567	5,612	5,620	5,632
Route 2 South	5,452	5,627	5,341	5,382	5,393	5,403	5,417
Route 3 North	5,609	6,924	6,710	6,938	6,954	7,114	7,272
Route 3 South	6,775	8,204	7,887	8,193	8,352	8,528	8,794
Route 4 North	8,736	6,036	5,628	5,950	6,058	6,047	6,036
Route 4 South	5,457	6,869	6,392	6,517	6,528	6,516	6,549
Route 5 North	8,436	8,465	7,791	7,949	8,071	8,182	8,355
Route 5 South	8,622	8,626	7,948	8,108	8,254	8,360	8,536
Route 6 North	8,996	8,966	8,328	8,500	8,557	8,576	8,672
Route 6 South	9,241	9,160	8,499	8,683	8,726	8,770	8,884
Route 7 North	5,657	3,948	3,752	3,867	3,929	4,081	4,125
Route 7 South	6,214	8,177	7,757	7,928	8,008	8,143	8,831
Route 8 North	6,277						
Route 8 South	3,917						
Route 9 North	10,621	10,990	10,692	10,952	11,177	11,440	11,633
Route 9 South	10,505	10,874	10,582	10,842	11,074	11,335	11,525
Route 11 North	8,870	6,088	5,812	5,841	5,867	5,891	6,000
Route 11 South	4,776	6,012	5,739	5,769	5,789	5,815	5,925
Route 14 North	9,879	8,898	8,252	8,330	8,631	8,680	8,802
Route 14 South	8,771	8,543	7,912	7,994	8,300	8,350	8,472
Airport Express North		5,462	5,209	5,356	5,565	5,558	5,589
Airport Express South		5,640	5,383	5,529	5,741	5,726	5,763
Burney Express North	2,651	2,661	2,304	2,319	2,326	2,371	2,395
Burney Express South	2,761	2,771	2,406	2,419	2,427	2,472	2,498
Cottonwood Express South		0	0	1711	1801	1882	1971
Cottonwood Express North		0	0	1498	1566	1623	1657

Total Employment Within 1/2 Mile of Transit Stops	49,097	53,184	57,711	61,780	64,257	66,515	68,753
Route 1 North	4,712	10,631	11,200	11,701	12,084	12,402	12,547
Route 1 South	5,131	14,136	15,856	17,005	17,740	18,376	18,971
Route 2 North	13,044	12,964	13,576	14,147	14,612	15,017	15,217
Route 2 South	12,492	13,015	13,622	14,181	14,637	15,028	15,210
Route 3 North	13,380	14,978	15,709	16,456	17,147	17,942	18,487
Route 3 South	17,911	19,625	20,430	21,559	22,550	23,667	24,542
Route 4 North	16,219	16,091	16,785	17,524	17,969	18,371	18,367
Route 4 South	11,848	12,236	12,822	13,352	13,694	14,003	14,015
Route 5 North	19,967	20,336	21,539	22,641	23,486	24,265	24,690
Route 5 South	20,058	20,440	21,645	22,748	23,595	24,375	24,800
Route 6 North	14,911	15,181	15,976	16,743	17,278	17,743	17,858
Route 6 South	14,568	14,900	15,680	16,429	16,945	17,390	17,488
Route 7 North	15,064	4,605	5,132	5,315	5,464	5,591	5,606
Route 7 South	14,462	8,719	9,475	9,852	10,089	10,295	10,304
Route 8 North							
Route 8 South							
Route 9 North	4,228	19,081	19,910	20,885	21,773	22,721	23,620
Route 9 South	1,389	18,749	19,559	20,510	21,375	22,294	23,175
Route 11 North	18,476	23,766	24,807	25,865	26,570	27,196	27,307
Route 11 South	18,314	24,061	25,121	26,201	26,929	27,582	27,711
Route 14 North	24,204	15,380	16,143	16,854	17,355	17,793	17,914
Route 14 South	9,866	14,967	15,709	16,392	16,868	17,279	17,382
Airport Express North		7,497	8,304	8,630	8,957	9,137	9,563
Airport Express South		7,707	8,537	8,887	9,235	9,427	9,852
Burney Express North	8,676	8,913	9,783	10,192	10,519	10,814	10,919
Burney Express South	8,731	8,959	9,831	10,243	10,572	10,870	10,974
Cottonwood Express South		0	0	1,775	1,848	1,922	2,008
Cottonwood Express North		0	0	1,688	1,756	1,817	1,890

Total Households Within 1/4 Mile of Transit Stops	31,679	32,214	30,290	31,613	32,064	32,530	32,977
Route 1 North	2,890	3,971	3,661	3,704	3,942	3,934	3,964
Route 1 South	3,115	4,086	3,791	3,884	4,137	4,349	4,358
Route 2 North	4,264	3,869	3,726	3,757	3,752	3,765	3,800
Route 2 South	3,312	3,531	3,424	3,452	3,452	3,454	3,494
Route 3 North	2,500	3,190	3,160	3,281	3,274	3,292	3,373
Route 3 South	3,082	3,758	3,551	3,715	3,794	3,916	4,092
Route 4 North	4,956	3,237	3,023	3,040	3,034	3,061	3,065
Route 4 South	2,212	3,141	2,925	2,961	2,946	2,962	2,962
Route 5 North	3,932	3,867	3,569	3,593	3,590	3,608	3,611
Route 5 South	4,413	4,266	3,933	3,959	4,007	4,027	4,053
Route 6 North	3,946	3,918	3,643	3,661	3,668	3,693	3,729
Route 6 South	5,114	4,945	4,588	4,631	4,635	4,639	4,682
Route 7 North	2,267	1,648	1,525	1,524	1,525	1,625	1,619
Route 7 South	2,868	4,319	4,054	4,159	4,174	4,266	4,264
Route 8 North							
Route 8 South							
Route 9 North	3,404	5,624	5,295	5,559	5,572	5,691	5,805
Route 9 South	2,227	5,272	5,003	5,249	5,257	5,367	5,469
Route 11 North	5,538	1,863	1,717	1,716	1,725	1,736	1,725
Route 11 South	5,182	2,192	1,990	2,005	2,020	2,040	2,040
Route 14 North	3,778	4,668	4,292	4,371	4,601	4,635	4,691
Route 14 South	1,720	4,828	4,456	4,526	4,749	4,773	4,836
Airport Express North	1,576	2,955	2,802	2,828	2,867	2,844	2,880
Airport Express South	3,887	2,929	2,768	2,794	2,834	2,809	2,848
Burney Express North	625	625	517	532	536	541	561
Burney Express South	666	666	549	567	574	581	608
Cottonwood Express South		0	0	775	813	835	871
Cottonwood Express North		0	0	616	656	675	715

Total Employment Within 1/4 Mile of Transit Stops	44,847	47,023	50,499	53,605	55,473	57,016	58,169
Route 1 North	3,256	5,530	5,704	5,935	6,104	6,241	6,277
Route 1 South	3,265	9,419	10,532	11,026	11,412	11,740	11,947
Route 2 North	11,803	11,720	12,276	12,759	13,163	13,512	13,693
Route 2 South	9,632	11,267	11,814	12,283	12,678	13,022	13,203
Route 3 North	7,900	8,754	9,216	9,647	9,996	10,285	10,365
Route 3 South	11,289	12,369	12,944	13,683	14,268	14,823	15,212
Route 4 North	12,180	11,794	12,361	12,925	13,243	13,534	13,529
Route 4 South	8,240	8,002	8,434	8,812	9,042	9,259	9,275
Route 5 North	13,055	13,509	14,304	14,956	15,391	15,774	15,859
Route 5 South	13,425	13,691	14,417	15,075	15,509	15,895	15,984
Route 6 North	10,009	10,188	10,680	11,091	11,434	11,734	11,801
Route 6 South	9,442	9,524	9,935	10,408	10,724	11,002	11,067
Route 7 North	8,794	1,847	1,905	1,959	1,989	2,015	2,013
Route 7 South	8,220	6,119	6,418	6,679	6,809	6,925	6,915
Route 8 North							
Route 8 South							
Route 9 North	3,045	11,252	11,844	12,486	12,950	13,356	13,511
Route 9 South	1,204	9,810	10,387	10,947	11,348	11,691	11,788
Route 11 North	11,394	15,564	16,417	17,143	17,596	17,994	18,027
Route 11 South	9,820	16,572	17,424	18,203	18,703	19,145	19,236
Route 14 North	15,944	11,778	12,404	12,948	13,304	13,613	13,702
Route 14 South	5,200	11,268	11,715	12,225	12,562	12,856	12,941
Airport Express North	5,077	4,811	5,474	5,680	5,905	6,002	6,432
Airport Express South	17,489	4,980	5,646	5,857	6,085	6,183	6,613
Burney Express North	3,281	3,189	3,570	3,691	3,778	3,851	3,876
Burney Express South	5,128	4,980	5,389	5,597	5,765	5,915	5,994
Cottonwood Express South		0	0	1,222	1,265	1,310	1,369
Cottonwood Express North		0	0	1,102	1,135	1,170	1,219

Figure 61: MOE_BASE.XLS Roadway Summary Sheet

Roadway Statistics	VMT, VHD, Miles						
	2005	2010	2015	2020	2025	2030	2035
Total Lane Miles of Roads in Analysis Area	**3,826.7**	**3,840.4**	**3,858.8**	**3,884.8**	**3,899.6**	**3,912.2**	**3,930.7**
5 year increment		13.7	32.1	25.9	14.8	12.6	18.5
Increase vs 2010			32.1	58.1	72.9	85.5	104.0
Daily Vehicle Miles of Travel on Roadways	**4,976,252**	**5,501,460**	**5,916,731**	**6,128,972**	**6,549,914**	**6,924,928**	**7,335,441**
Freeway	1,959,604	2,258,253	2,472,439	2,634,162	2,845,745	3,049,274	3,254,186
Highway	1,020,877	1,176,582	1,261,485	1,263,102	1,350,167	1,419,936	1,496,569
Expressway	209,845	222,473	230,106	231,031	244,811	257,256	271,333
Arterial	990,062	1,013,642	1,076,196	1,105,494	1,165,671	1,212,272	1,272,236
Collector	314,934	328,506	347,445	356,981	380,559	403,386	433,014
Local	86,305	91,618	97,152	100,892	104,469	108,831	113,221
Ramp	104,520	107,651	115,020	119,046	125,528	126,588	133,394
Zone Connector	290,106	302,734	316,888	318,265	332,964	347,387	361,488
Daily Vehicle Hours of Delay	**1,564**	**1,391**	**1,564**	**1,459**	**1,686**	**1,946**	**2,367**
Freeway	18.6	64.7	56.8	48.0	34.3	64.6	103.7
Highway	106.4	110.0	114.6	84.0	104.2	136.3	150.6
Expressway	445.7	215.0	254.2	235.8	276.6	314.5	389.1
Arterial	553.1	510.8	604.8	518.3	589.7	671.4	840.4
Collector	215.3	224.3	249.2	273.6	359.6	402.8	465.8
Local	133.7	149.8	147.7	152.8	156.1	158.3	173.3
Ramp	91.2	116.2	131.5	145.9	165.3	198.4	244.1
Zone Connector	0.0	0.4	5.5	0.1	0.0	0.0	0.0
Miles of Roads at LOS E/F	**12.2**	**8.9**	**9.0**	**7.2**	**8.6**	**13.8**	**9.9**
Freeway	0.9	1.7	0.9	0.9	0.9	6.3	0.9
Highway	2.5	2.5	2.5	2.5	2.5	3.1	2.5
Expressway	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Arterial	3.5	2.5	3.6	1.6	2.3	1.8	3.3
Collector	0.4	0.3	0.3	0.5	0.8	0.9	1.2
Local	0.2	0.2	0.0	0.0	0.4	0.0	0.2
Ramp	1.7	1.7	1.7	1.7	1.7	1.7	1.9
Zone Connector	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 62: MOE_BASE.XLS Meas_SHxx Sheet

ROAD SYSTEM MEASURES OF EFFECTIVENESS						
Shasta County 2010						
Daily Vehicle Miles of Travel	5,501,460		County			
Daily VMT: Through Trips	913,519					
Daily VMT: To/From Redding	3,316,706					
Daily Vehicle Hours of Delay	1,391		1			
Miles of Roads at LOS E/F	8.9					
Total Lane Miles of Roads	3,840					

	AM Peak Period	PM Peak Period	Off Peak Period	Daily	Daily XX	Daily Redding
VEHICLE MILES OF TRAVEL						
Freeway						
Freeway	117,520	121,984	2,018,750	2,258,253	709,516	1,159,644
Highway						
Multi-Lane Rural Highway	4,775	4,944	56,691	66,410	4,533	36,323
2-Lane Rural Highway	76,408	59,782	973,982	1,110,172	189,439	601,903
Total	**81,183**	**64,726**	**1,030,673**	**1,176,582**	**193,972**	**638,226**
Expressway						
Urban Expressway	17,838	20,222	184,414	222,473	2,264	188,342
Arterial						
Multi-Lane Rural Arterial	1,333	1,557	14,226	17,115	0	10,602
2-Lane Rural Arterial	24,990	26,552	268,850	320,391	53	175,715
Urban Arterial	51,381	65,444	559,310	676,135	3,274	603,605
Total	**77,703**	**93,553**	**842,386**	**1,013,642**	**3,327**	**789,922**
Collector						
Rural Collector	14,392	14,728	188,372	217,491	3,326	107,894
Urban Collector	8,575	10,778	91,661	111,015	4	95,349
Total	**22,967**	**25,506**	**280,033**	**328,506**	**3,329**	**203,243**
Local						
Rural Local	1,084	946	32,587	34,617	257	11,282
Urban Local	4,332	5,707	46,962	57,002	0	53,274
Total	**5,416**	**6,653**	**79,549**	**91,618**	**257**	**64,557**
Ramp						
Ramp	8,231	9,489	89,931	107,651	853	90,808
Connector						
Zone Connector	23,459	28,197	251,078	302,734	0	181,966
TOTAL	**354,316**	**370,330**	**4,776,814**	**5,501,460**	**913,519**	**3,316,706**

VEHICLE HOURS OF TRAVEL, FREE-FLOW SPEEDS					
Freeway					
	Freeway	1,882	1,952	32,020	35,854
Highway					
	Multi-Lane Rural Highway	103	104	1,212	1,419
	2-Lane Rural Highway	1,535	1,202	20,227	22,963
	Total	**1,638**	**1,305**	**21,439**	**24,382**
Expressway					
	Urban Expressway	410	465	4,233	5,107
Arterial					
	Multi-Lane Rural Arterial	33	38	346	416
	2-Lane Rural Arterial	559	596	6,025	7,179
	Urban Arterial	1,419	1,810	15,480	18,709
	Total	**2,010**	**2,444**	**21,850**	**26,304**
Collector					
	Rural Collector	361	371	5,020	5,751
	Urban Collector	290	367	3,133	3,790
	Total	**651**	**738**	**8,153**	**9,542**
Local					
	Rural Local	32	29	945	1,006
	Urban Local	166	220	1,808	2,195
	Total	**199**	**249**	**2,753**	**3,201**
Ramp					
	Ramp	184	212	2,003	2,398
Connector					
	Zone Connector	1,125	1,379	12,141	14,645
TOTAL		**8,097**	**8,744**	**104,592**	**121,434**
AVERAGE SPEEDS, FREE-FLOW SPEEDS					
Freeway					
	Freeway	62.5	62.5	63.0	63.0
Highway					
	Multi-Lane Rural Highway	46.5	47.7	46.8	46.8
	2-Lane Rural Highway	49.8	49.7	48.2	48.3
	Total	**49.6**	**49.6**	**48.1**	**48.3**
Expressway					
	Urban Expressway	43.5	43.5	43.6	43.6
Arterial					
	Multi-Lane Rural Arterial	40.6	41.3	41.1	41.1
	2-Lane Rural Arterial	44.7	44.6	44.6	44.6
	Urban Arterial	36.2	36.2	36.1	36.1
	Total	**38.7**	**38.3**	**38.6**	**38.5**
Collector					
	Rural Collector	39.9	39.7	37.5	37.8
	Urban Collector	29.6	29.3	29.3	29.3
	Total	**35.3**	**34.5**	**34.3**	**34.4**
Local					
	Rural Local	33.6	33.1	34.5	34.4
	Urban Local	26.0	25.9	26.0	26.0
	Total	**27.3**	**26.8**	**28.9**	**28.6**
Ramp					
	Ramp	44.8	44.8	44.9	44.9
Connector					
	Zone Connector	20.9	20.4	20.7	20.7
TOTAL		**43.8**	**42.4**	**45.7**	**45.3**

AVERAGE SPEEDS, CONGESTED SPEEDS					
Freeway					
	Freeway	62.2	62.4	62.9	62.9
Highway					
	Multi-Lane Rural Highway	46.5	47.7	46.8	46.8
	2-Lane Rural Highway	49.0	49.6	48.0	48.1
	Total	**48.8**	**49.4**	**47.9**	**48.0**
Expressway					
	Urban Expressway	40.7	40.6	42.0	41.8
Arterial					
	Multi-Lane Rural Arterial	40.6	41.3	41.1	41.1
	2-Lane Rural Arterial	44.7	44.5	44.6	44.6
	Urban Arterial	34.5	34.5	35.3	35.2
	Total	**37.4**	**37.0**	**37.9**	**37.8**
Collector					
	Rural Collector	39.7	39.6	37.5	37.7
	Urban Collector	27.3	27.2	27.8	27.7
	Total	**33.9**	**33.2**	**33.7**	**33.6**
Local					
	Rural Local	33.5	33.0	34.4	34.3
	Urban Local	23.5	23.6	24.5	24.3
	Total	**25.0**	**24.6**	**27.8**	**27.3**
Ramp					
	Ramp	41.6	41.3	43.1	42.8
Connector					
	Zone Connector	20.9	20.4	20.7	20.7
TOTAL		**42.8**	**41.4**	**45.2**	**44.8**
VEHICLE HOURS OF DELAY, CONGESTED SPEEDS					
Freeway					
	Freeway	8	3	53	65
Highway					
	Multi-Lane Rural Highway	0	0	0	0
	2-Lane Rural Highway	24	4	81	110
	Total	**24**	**4**	**81**	**110**
Expressway					
	Urban Expressway	29	33	153	215
Arterial					
	Multi-Lane Rural Arterial	0	0	0	0
	2-Lane Rural Arterial	0	0	1	1
	Urban Arterial	70	88	352	509
	Total	**70**	**88**	**353**	**511**
Collector					
	Rural Collector	1	1	9	11
	Urban Collector	25	28	160	213
	Total	**26**	**29**	**169**	**224**
Local					
	Rural Local	0	0	2	3
	Urban Local	18	22	107	147
	Total	**18**	**22**	**110**	**150**
Ramp					
	Ramp	14	18	84	116
Connector					
	Zone Connector	0	0	0	0
TOTAL		**190**	**198**	**1,003**	**1,391**

MILES OF CONGESTED ROAD	LOS D	LOS E	LOS F	TOTAL
Freeway				
Freeway	8.6	0.9	0.9	10.3
Highway				
Multi-Lane Rural Highway	0.0	0.0	0.0	0.0
2-Lane Rural Highway	39.4	2.5	0.0	41.9
Total	**39.4**	**2.5**	**0.0**	**41.9**
Expressway				
Urban Expressway	1.6	0.0	0.0	1.6
Arterial				
Multi-Lane Rural Arterial	0.0	0.0	0.0	0.0
2-Lane Rural Arterial	1.6	0.0	0.0	1.6
Urban Arterial	72.6	2.5	0.0	75.1
Total	**74.2**	**2.5**	**0.0**	**76.7**
Collector				
Rural Collector	0.0	0.0	0.0	0.0
Urban Collector	4.2	0.2	0.1	4.5
Total	**4.2**	**0.2**	**0.1**	**4.5**
Local				
Rural Local	0.0	0.0	0.0	0.0
Urban Local	4.4	0.2	0.0	4.6
Total	**4.4**	**0.2**	**0.0**	**4.6**
Ramp				
Ramp	1.1	1.7	0.0	2.9
Connector				
Zone Connector	0.0	0.0	0.0	0.0
TOTAL	**133.6**	**8.0**	**0.9**	**142.5**

TOTAL LANE-MILES OF ROAD	
Freeway	
Freeway	307.8
Highway	
Multi-Lane Rural Highway	32.7
2-Lane Rural Highway	479.4
Total	**512**
Expressway	
Urban Expressway	52.0
Arterial	
Multi-Lane Rural Arterial	16.5
2-Lane Rural Arterial	326.6
Urban Arterial	257.9
Total	**601**
Collector	
Rural Collector	775.9
Urban Collector	163.1
Total	**939**
Local	
Rural Local	273.0
Urban Local	97.9
Total	**371**
Ramp	
Ramp	36.2
Connector	
Zone Connector	1,021.3
TOTAL	**3,840**

Figure 63: VMT_Summaries_Comparison.XLS

Alternative	Jurisdiction/SGA	House-holds	Popul-ation	Employ ment	Household Based VMT				Non-HH IXXI VMT	Total IXXI VMT	Commercial Vehicles			Intra-zonal VMT	Total SB375 VMT	Thru (XX) Trips VMT	TOTAL VMT
					II	IXXI	Total	per Capita			II VMT	IX VMT	XI VMT				
SH05	Anderson Non-SGA	1,927	4,785	1,287	67,515	12,347	79,862	16.7	15,621	27,968	10,530	1,678	2,001				
	Anderson SGA	2,015	5,031	2,089	67,123	12,746	79,869	15.9	16,834	29,580	15,848	1,947	2,364				
	Redding Non-SGA	33,852	84,265	31,668	938,134	224,796	1,162,930	31.5	353,004	577,800	161,830	36,965	43,620				
	Redding DT SGA	3,268	8,086	12,217	63,863	22,351	86,214	10.7	120,999	143,350	35,221	10,313	12,124				
	Shasta Lake Non-SGA	1,903	4,721	464	72,250	11,571	83,821	17.8	11,110	22,681	7,415	1,381	1,645				
	Shasta Lake DT SGA	1,354	3,405	1,165	45,283	10,416	55,699	16.4	14,033	24,449	9,568	1,340	1,640				
	Uninc Non-SGA	21,930	54,077	9,649	1,297,508	186,955	1,484,462	27.5	167,922	354,876	138,501	28,372	30,632				
	Cotonwood SGA	1,216	3,115	826	51,933	5,035	56,968	18.3	6,208	11,243	8,661	722	917				
	Palo Cedro SGA	874	2,087	705	39,077	7,073	46,150	22.1	9,716	16,789	6,682	1,008	1,252				
	Burney SGA	1,546	3,795	1,261	107,534	9,215	116,749	30.8	15,819	25,033	12,408	4,843	3,392				
	Fall River Mills SGA	458	1,128	882	39,566	2,599	42,165	37.4	8,218	10,817	6,155	2,395	1,389				
SH05 Total		**70,343**	**174,495**	**62,213**	**2,789,786**	**505,104**	**3,294,889**	**18.88**	**739,483**	**1,244,587**	**412,817**	**90,962**	**100,976**	**37,351**	**4,676,479**	**967,411**	**5,643,890**
	% of Total VMT				49%	9%	58%		13%	22%	7%	2%	2%	1%	83%	17%	100%

Alternative	Jurisdiction/SGA	House-holds	Popul-ation	Employ ment	Household Based VMT				Non-HH IXXI VMT	Total IXXI VMT	Commercial Vehicles			Intra-zonal VMT	Total SB375 VMT	Thru (XX) Trips VMT	TOTAL VMT
					II	IXXI	Total	per Capita			II VMT	IX VMT	XI VMT				
SH10	Anderson Non-SGA	1,936	4,855	1,322	67,333	11,548	78,881	16.2	14,818	26,365	10,684	1,652	1,945				
	Anderson SGA	2,068	5,070	2,353	68,945	13,385	82,330	16.2	17,660	31,045	17,600	2,013	2,428				
	Redding Non-SGA	34,443	85,248	32,556	954,924	216,409	1,171,334	31.2	341,676	558,085	164,749	35,911	41,973				
	Redding DT SGA	3,311	8,316	12,469	65,822	21,504	87,325	10.5	117,682	139,185	35,865	10,021	11,596				
	Shasta Lake Non-SGA	1,914	4,850	395	76,105	11,060	87,165	18.0	10,024	21,084	7,153	1,235	1,462				
	Shasta Lake DT SGA	1,351	3,439	1,303	45,734	9,754	55,488	16.1	14,113	23,867	10,238	1,434	1,738				
	Uninc Non-SGA	22,034	54,628	9,608	1,307,503	176,144	1,483,647	27.2	159,530	335,674	138,788	27,406	29,260				
	Cotonwood SGA	1,223	3,080	742	52,059	4,847	56,906	18.5	5,265	10,112	8,379	698	874				
	Palo Cedro SGA	869	2,124	743	37,118	6,790	43,908	20.7	9,587	16,377	6,874	982	1,209				
	Burney SGA	1,549	3,774	1,274	103,063	8,833	111,896	29.6	15,244	24,078	12,702	4,633	3,210				
	Fall River Mills SGA	453	1,081	899	42,122	2,352	44,474	41.1	7,686	10,038	6,243	2,293	1,317				
SH10 Total		**71,151**	**176,465**	**63,664**	**2,820,727**	**482,626**	**3,303,353**	**18.72**	**713,284**	**1,195,910**	**419,276**	**88,280**	**97,010**	**35,103**	**4,656,306**	**913,519**	**5,569,825**
	% of Total VMT				51%	9%	59%		13%	21%	8%	2%	2%	1%	84%	16%	100%

Alternative	Jurisdiction/SGA	House-holds	Popul-ation	Employ ment	Household Based VMT				Non-HH IXXI VMT	Total IXXI VMT	Commercial Vehicles			Intra-zonal VMT	Total SB375 VMT	Thru (XX) Trips VMT	TOTAL VMT
					II	IXXI	Total	per Capita			II VMT	IX VMT	XI VMT				
SH13	Anderson Non-SGA	1,948	4,795	1,365	63,476	12,444	75,920	15.8	16,407	28,851	10,814	1,809	2,134				
	Anderson SGA	2,061	5,023	2,383	64,906	14,624	79,529	15.8	19,673	34,296	17,587	2,157	2,610				
	Redding Non-SGA	34,440	85,404	33,244	965,670	235,283	1,200,953	31.7	377,643	612,926	165,995	38,835	45,478				
	Redding DT SGA	3,318	8,260	12,689	65,577	23,341	88,917	10.8	129,452	152,793	36,235	10,846	12,588				
	Shasta Lake Non-SGA	1,922	4,662	406	69,795	11,741	81,536	17.5	10,837	22,578	7,196	1,335	1,578				
	Shasta Lake DT SGA	1,347	3,267	1,321	40,282	10,708	50,990	15.6	15,692	26,400	10,278	1,558	1,881				
	Uninc Non-SGA	22,014	54,780	9,833	1,309,110	190,372	1,499,481	27.4	174,350	364,722	138,941	29,472	31,517				
	Cotonwood SGA	1,216	3,026	753	49,547	5,262	54,809	18.1	5,974	11,235	8,340	738	924				
	Palo Cedro SGA	874	2,192	753	36,169	7,478	43,647	19.9	10,576	18,054	6,908	1,056	1,303				
	Burney SGA	1,543	3,874	1,288	108,636	9,162	117,797	30.4	16,186	25,348	12,714	4,909	3,383				
	Fall River Mills SGA	468	1,201	904	40,394	2,716	43,110	35.9	8,574	11,290	6,268	2,415	1,380				
SH13 Total		**71,151**	**176,484**	**64,939**	**2,813,561**	**523,130**	**3,336,691**	**18.91**	**785,363**	**1,308,494**	**421,276**	**95,130**	**104,776**	**34,363**	**4,777,599**	**957,394**	**5,734,993**
	% of Total VMT				49%	9%	58%		14%	23%	7%	2%	2%	1%	83%	17%	100%

Alternative	Jurisdiction/SGA	House-holds	Popul-ation	Employ ment	Household Based VMT				Non-HH IXXI VMT	Total IXXI VMT	Commercial Vehicles			Intra-zonal VMT	Total SB375 VMT	Thru (XX) Trips VMT	TOTAL VMT
					II	IXXI	Total	per Capita			II VMT	IX VMT	XI VMT				
SH15	Anderson Non-SGA	2,149	5,419	1,447	74,291	13,165	87,456	16.1	17,058	30,223	11,657	1,984	2,324				
	Anderson SGA	2,072	5,145	2,430	68,972	14,305	83,276	16.2	19,750	34,054	17,844	2,202	2,645				
	Redding Non-SGA	35,968	88,899	35,446	1,030,298	240,675	1,270,973	32.8	399,293	639,968	177,052	40,396	47,061				
	Redding DT SGA	3,613	9,022	13,039	72,034	24,366	96,399	10.7	129,333	153,698	37,864	11,185	12,908				
	Shasta Lake Non-SGA	1,939	4,888	461	78,938	12,273	91,211	18.7	11,952	24,225	7,432	1,416	1,673				
	Shasta Lake DT SGA	1,350	3,244	1,361	41,700	10,253	51,953	16.0	15,516	25,769	10,356	1,586	1,898				
	Uninc Non-SGA	22,153	55,216	11,019	1,340,125	196,546	1,536,672	27.8	195,047	391,593	145,028	31,340	33,458				
	Cotonwood SGA	1,225	3,154	919	54,750	5,617	60,368	19.1	7,741	13,358	9,169	859	1,067				
	Palo Cedro SGA	977	2,470	780	43,868	7,751	51,620	20.9	10,706	18,457	7,333	1,119	1,371				
	Burney SGA	1,556	3,686	1,607	95,491	9,440	104,931	28.5	19,696	29,135	13,858	5,638	3,960				
	Fall River Mills SGA	469	1,118	1,015	38,749	2,699	41,448	37.1	9,379	12,078	6,818	2,716	1,588				
SH15 Total		**73,471**	**182,261**	**69,524**	**2,939,217**	**537,090**	**3,476,307**	**19.07**	**835,469**	**1,372,559**	**444,410**	**100,443**	**109,955**	**35,415**	**5,001,998**	**986,765**	**5,988,763**
	% of Total VMT				49%	9%	58%		14%	23%	7%	2%	2%	1%	84%	16%	100%

Alternative	Jurisdiction/SGA	House-holds	Popul-ation	Employ ment	Household Based VMT				Non-HH IXXI VMT	Total IXXI VMT	Commercial Vehicles			Intra-zonal VMT	Total SB375 VMT	Thru (XX) Trips VMT	TOTAL VMT
					II	IXXI	Total	per Capita			II VMT	IX VMT	XI VMT				
SH20	Anderson Non-SGA	2,134	5,331	1,522	68,322	14,077	82,399	15.5	18,864	32,941	11,886	2,179	2,551				
	Anderson SGA	2,418	6,024	2,579	77,274	17,680	94,954	15.8	23,497	41,177	19,357	2,564	3,073				
	Redding Non-SGA	38,801	96,307	37,342	1,072,143	280,547	1,352,690	31.8	460,405	740,952	188,113	45,256	52,778				
	Redding DT SGA	3,781	9,506	13,775	73,514	27,406	100,920	10.6	146,772	174,178	39,858	12,464	14,413				
	Shasta Lake Non-SGA	1,952	5,109	498	73,670	13,271	86,941	17.0	13,056	26,327	7,587	1,566	1,845				
	Shasta Lake DT SGA	1,349	3,354	1,502	40,313	11,124	51,437	15.3	18,403	29,527	10,899	1,937	2,296				
	Uninc Non-SGA	22,549	55,625	11,645	1,234,972	214,795	1,449,767	26.1	218,428	433,223	149,014	34,657	36,932				
	Cotonwood SGA	1,254	3,125	993	47,185	6,002	53,187	17.0	8,766	14,768	9,545	954	1,183				
	Palo Cedro SGA	980	2,418	858	39,342	8,692	48,034	19.9	12,838	21,530	7,727	1,286	1,570				
	Burney SGA	1,585	3,960	1,745	86,734	10,206	96,941	24.5	22,405	32,611	14,521	6,280	4,410				
	Fall River Mills SGA	480	1,146	1,126	29,139	2,832	31,971	27.9	10,459	13,290	7,270	3,060	1,806				
SH20 Total		**77,283**	**191,905**	**73,585**	**2,842,609**	**606,631**	**3,449,240**	**17.97**	**953,893**	**1,560,524**	**465,777**	**112,202**	**122,859**	**37,524**	**5,141,494**	**1,059,960**	**6,201,454**
	% of Total VMT				46%	10%	56%		15%	25%	8%	2%	2%	1%	83%	17%	100%

Alternative	Jurisdiction/SGA	House-holds	Popul-ation	Employ ment	Household Based VMT				Non-HH IXXI VMT	Total IXXI VMT	Commercial Vehicles			Intra-zonal VMT	Total SB375 VMT	Thru (XX) Trips VMT	TOTAL VMT
					II	IXXI	Total	per Capita			II VMT	IX VMT	XI VMT				
SH25	Anderson Non-SGA	2,257	5,526	1,620	69,195	15,808	85,003	15.4	21,166	36,974	12,454	2,419	2,837				
	Anderson SGA	3,033	7,483	2,666	101,986	22,768	124,754	16.7	27,096	49,864	21,044	2,945	3,527				
	Redding Non-SGA	40,163	99,160	38,761	1,120,928	312,084	1,433,012	32.4	499,468	811,551	194,986	49,865	58,230				
	Redding DT SGA	3,875	9,685	14,395	75,064	30,483	105,547	10.9	161,299	191,782	41,492	13,769	15,968				
	Shasta Lake Non-SGA	2,125	5,343	521	79,006	15,232	94,239	17.6	14,018	29,250	8,115	1,759	2,074				
	Shasta Lake DT SGA	1,361	3,433	1,659	42,107	11,989	54,096	15.8	20,653	32,643	11,517	2,400	2,826				
	Uninc Non-SGA	23,352	58,283	12,037	1,273,466	236,887	1,510,353	25.9	232,944	469,831	152,399	37,673	40,136				
	Cotonwood SGA	1,294	3,203	1,047	50,152	6,626	56,778	17.7	9,368	15,993	9,795	1,041	1,291				
	Palo Cedro SGA	1,005	2,508	913	41,366	9,647	51,013	20.3	14,317	23,964	8,050	1,447	1,761				
	Burney SGA	1,613	4,017	1,848	84,181	11,233	95,414	23.8	25,304	36,536	14,961	6,891	4,837				
	Fall River Mills SGA	510	1,336	1,218	30,031	3,389	33,420	25.0	12,778	16,166	7,659	3,421	2,035				
SH25 Total		**80,588**	**199,977**	**76,685**	**2,967,483**	**676,145**	**3,643,628**	**18.22**	**1,038,410**	**1,714,555**	**482,472**	**123,628**	**135,522**	**38,592**	**5,462,252**	**1,132,936**	**6,595,188**
	% of Total VMT				45%	10%	55%		16%	26%	7%	2%	2%	1%	83%	17%	100%

Alternative	Jurisdiction/SGA	House-holds	Popul-ation	Employ ment	Household Based VMT				Non-HH IXXI VMT	Total IXXI VMT	Commercial Vehicles			Intra-zonal VMT	Total SB375 VMT	Thru (XX) Trips VMT	TOTAL VMT
					II	IXXI	Total	per Capita			II VMT	IX VMT	XI VMT				
SH30	Anderson Non-SGA	2,245	5,540	1,668	73,304	17,040	90,344	16.3	23,208	40,248	12,522	2,597	3,052				
	Anderson SGA	3,037	7,449	2,746	97,652	23,560	121,211	16.3	29,373	52,933	21,100	3,144	3,766				
	Redding Non-SGA	41,106	101,362	40,148	1,131,405	339,779	1,471,184	32.1	550,518	890,298	201,375	54,661	63,966				
	Redding DT SGA	4,007	10,183	14,989	76,026	34,104	110,129	10.8	187,865	221,969	43,188	15,084	17,540				
	Shasta Lake Non-SGA	2,228	5,469	537	81,069	16,877	97,946	17.9	15,366	32,243	8,427	1,912	2,260				
	Shasta Lake DT SGA	1,396	3,392	1,765	41,530	13,025	54,555	16.1	24,565	37,590	12,005	2,755	3,246				
	Uninc Non-SGA	24,994	62,598	12,353	1,341,199	266,509	1,607,708	25.7	255,173	521,682	157,860	40,757	43,471				
	Cotonwood SGA	1,365	3,398	1,104	53,570	7,623	61,193	18.0	11,053	18,676	10,078	1,130	1,401				
	Palo Cedro SGA	1,077	2,659	966	44,142	10,898	55,040	20.7	16,251	27,149	8,504	1,625	1,977				
	Burney SGA	1,660	4,155	1,942	83,059	12,113	95,171	22.9	27,631	39,744	15,380	7,481	5,260				
	Fall River Mills SGA	521	1,243	1,311	26,517	3,501	30,019	24.2	13,655	17,156	7,995	3,755	2,250				
SH30 Total		**83,636**	**207,448**	**79,529**	**3,049,471**	**745,029**	**3,794,501**	**18.29**	**1,154,660**	**1,899,689**	**498,433**	**134,901**	**148,189**	**38,759**	**5,769,443**	**1,206,129**	**6,975,572**
	% of Total VMT				44%	11%	54%		17%	27%	7%	2%	2%	1%	83%	17%	100%

Alternative	Jurisdiction/SGA	House-holds	Popul-ation	Employ ment	Household Based VMT				Non-HH IXXI VMT	Total IXXI VMT	Commercial Vehicles			Intra-zonal VMT	Total SB375 VMT	Thru (XX) Trips VMT	TOTAL VMT
					II	IXXI	Total	per Capita			II VMT	IX VMT	XI VMT				
SH35	Anderson Non-SGA	2,295	5,929	1,661	75,444	18,257	93,701	15.8	24,342	42,599	12,411	2,833	3,139				
	Anderson SGA	3,060	7,701	3,088	103,084	26,257	129,341	16.8	36,212	62,469	22,013	3,596	4,042				
	Redding Non-SGA	42,614	105,947	41,497	1,187,596	373,307	1,560,903	32.8	609,349	982,656	209,393	62,606	68,989				
	Redding DT SGA	4,178	10,628	15,447	78,527	37,525	116,052	10.9	204,842	242,366	44,804	17,342	19,038				
	Shasta Lake Non-SGA	2,257	5,633	544	85,614	18,415	104,029	18.5	16,825	35,239	8,528	2,129	2,372				
	Shasta Lake DT SGA	1,406	3,343	1,848	39,763	13,587	53,350	16.0	25,277	38,864	12,351	3,238	3,590				
	Uninc Non-SGA	25,881	63,713	12,647	1,369,553	289,775	1,659,329	26.0	275,197	564,972	158,598	44,796	47,003				
	Cotonwood SGA	1,454	3,596	1,146	55,507	8,563	64,070	17.8	12,234	20,797	10,358	1,287	1,485				
	Palo Cedro SGA	1,140	2,858	1,009	47,176	12,204	59,380	20.8	17,936	30,139	8,882	1,891	2,154				
	Burney SGA	1,709	4,159	1,996	83,492	13,566	97,058	23.3	30,444	44,010	14,495	8,136	5,816				
	Fall River Mills SGA	540	1,323	1,369	30,884	3,948	34,831	26.3	15,418	19,365	7,601	4,006	2,520				
SH35 Total		**86,534**	**214,830**	**82,252**	**3,156,641**	**815,403**	**3,972,044**	**18.49**	**1,268,074**	**2,083,477**	**509,436**	**151,860**	**160,149**	**39,595**	**6,101,158**	**1,279,377**	**7,380,535**
	% of Total VMT				43%	11%	54%		17%	28%	7%	2%	2%	1%	83%	17%	100%

SACOG formula for residential share of IXXI non-commercial trips:

= Households/(Households+1.1*(Total Employment-Food Employment-Retail Employment-0.25*Service Employment)

Figure 64: EMFAC_SPEED_BINS_SRTA_SB375.XLSX

Speed Bin	Daily Network Based VMT (excluding through trips that do not originate or terminate in Shasta County)							
	2005	2010	2013	2015	2020	2025	2030	2035
5	2	2	2	2	2	2	2	2
10	404	423	411	420	312	429	1,047	1,167
15	79,127	77,910	79,019	81,587	86,321	91,790	94,008	99,133
20	98,220	97,138	98,035	102,665	107,052	114,828	124,511	135,710
25	343,233	335,714	342,042	357,062	357,959	380,597	397,485	412,601
30	176,990	169,277	170,672	180,734	190,386	204,474	213,643	230,040
35	426,544	411,176	421,213	437,165	458,727	485,876	509,852	533,756
40	353,238	370,860	371,894	381,669	389,435	415,954	439,952	464,782
45	592,819	612,682	625,205	651,751	657,757	693,384	719,500	767,386
50	904,016	903,241	922,924	959,173	941,845	990,619	1,029,139	1,068,513
55	121,000	132,547	119,679	126,240	130,497	138,170	144,154	159,180
60	646,206	633,986	659,487	721,716	742,284	769,241	815,161	854,256
65	896,912	879,415	933,999	965,235	1,043,936	1,170,261	1,269,067	1,369,094
70	0	0	0	0	0	0	0	0
Total	4,638,709	**4,624,372**	**4,744,583**	**4,965,417**	**5,106,514**	**5,455,626**	**5,757,521**	**6,095,620**
Intrazonal	37,351	35,103	34,363	35,415	37,524	38,592	38,759	39,595
XX	967,411	913,519	957,394	986,765	1,059,960	1,132,936	1,206,129	1,279,377
Total Inc XX	**5,606,121**	**5,537,891**	**5,701,977**	**5,952,182**	**6,166,473**	**6,588,562**	**6,963,651**	**7,374,997**