Shasta Regional Transportation Agency (SRTA)
Activity-Based Travel Demand (ShastaSIM)
Model Users Guide
July 2014

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 the 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/pastel/RT_TDM.htm.

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 (Citilabs)
- DAYSIM08 (Bowman and Bradley)
- Excel 2010 or 2013 (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***
  **Because the Windows XP operating system is no longer supported by Microsoft, it is not recommended.*

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 3 - 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.

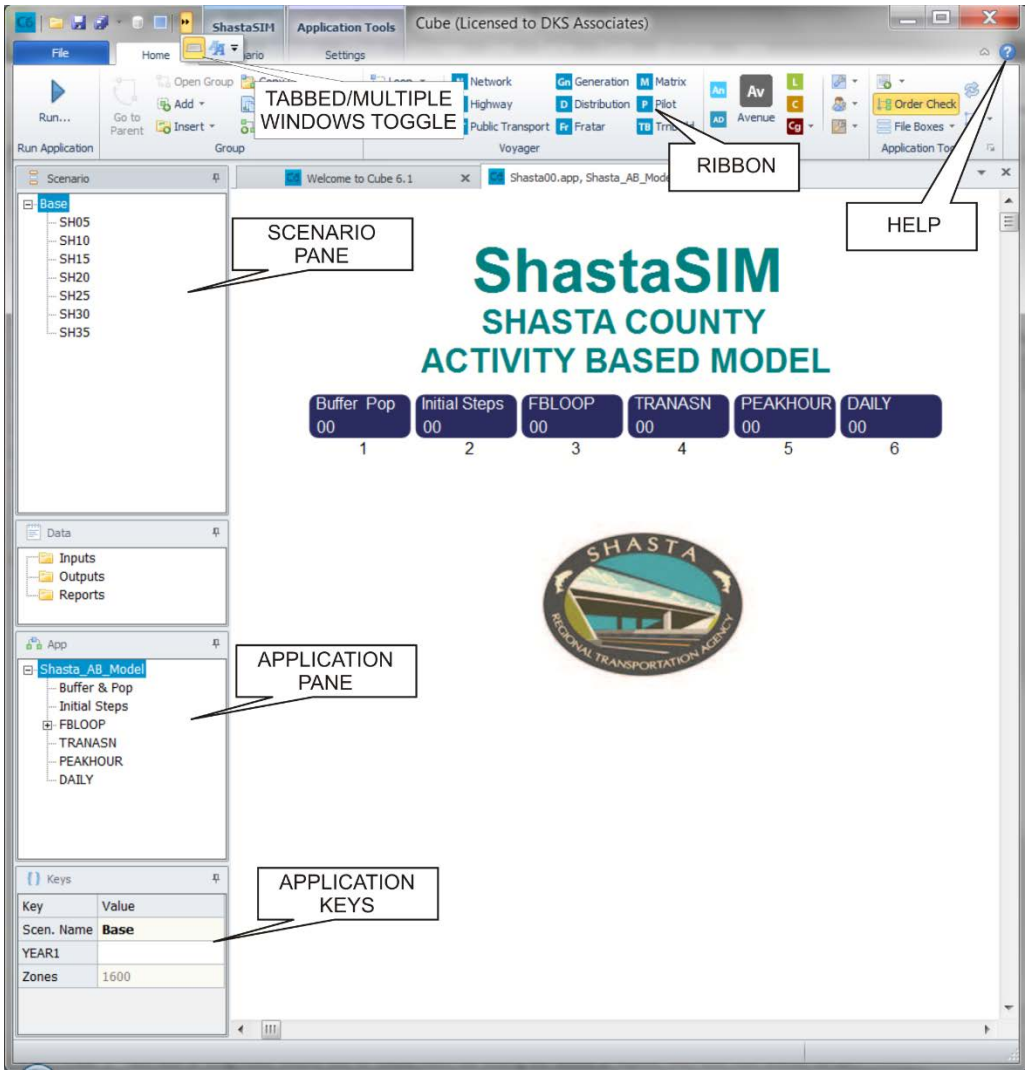
The **APPLICATION KEYS PANE** shows a list of "keys" which are text fields dependent on the scenario selected. Keys may represent input and output file names, directory names, numbers, character strings or Boolean flags. More information regarding keys, including how to edit, rename, delete or load keys can be found in Chapter 15 of Citilabs' CUBE Base Model Reference Guide

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**.

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
    - SH15
    - SH20
    - SH25
    - SH30
    - SH35
  - **COMMON_START_FILES**
    - SH05
    - SH10
    - SH15
    - SH20
    - SH25
    - SH30

- SH35
- **COMPARE**
  - LU
  - NETWORKS
  - OUTPUTS
    - DELTA
    - LOS
    - 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 files for use as backgrounds in CUBE mapping.

In order for a specific scenario to be run, the following 24 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_THRU.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**

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. 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. 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.

The last three (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.

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

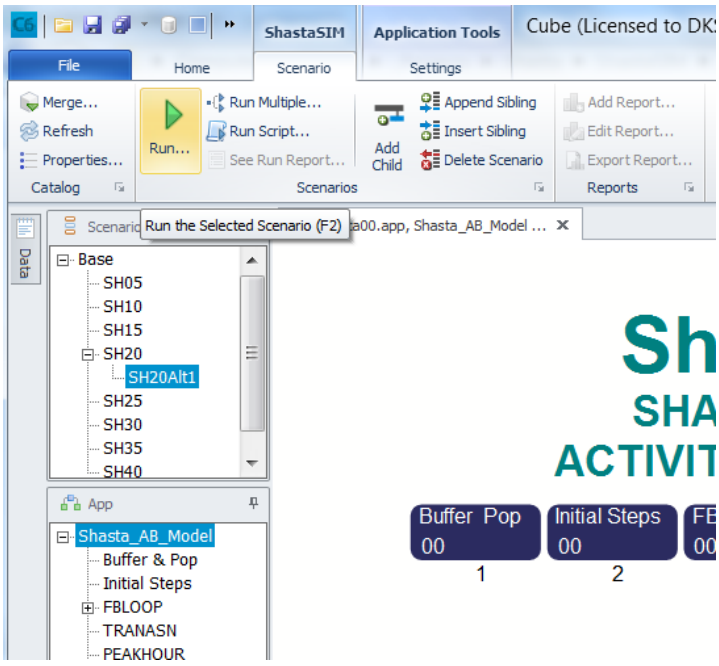
Like the Shasta County four step model before it, ShastaSIM runs in the CUBE Application Manager environment. After a new scenario has been created, as described in chapter 4, all necessary files copied over to the new directory, and the necessary files edited (roadway network, transit lines, and land use), the scenario can be run using the ShastaSIM application in Cube.

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

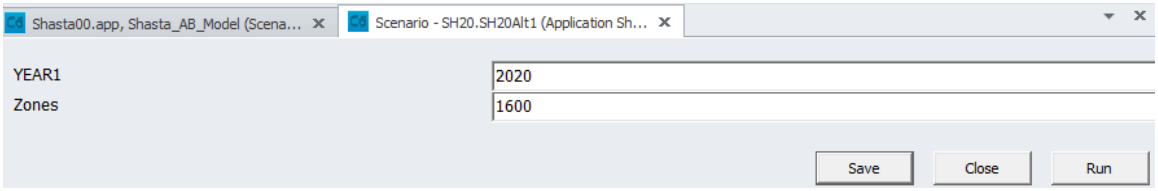
1. Open **SHASTASIM.CAT** by either:
   a. Double clicking on the file in the Catalog Directory
      ShastaSIM.cat, or;
   b. Opening CUBE and opening the catalog file from within CUBE
      Open… Ctrl+O
      If the scenario pane on the left is too small to see all scenarios, it can be stretched.

2. 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

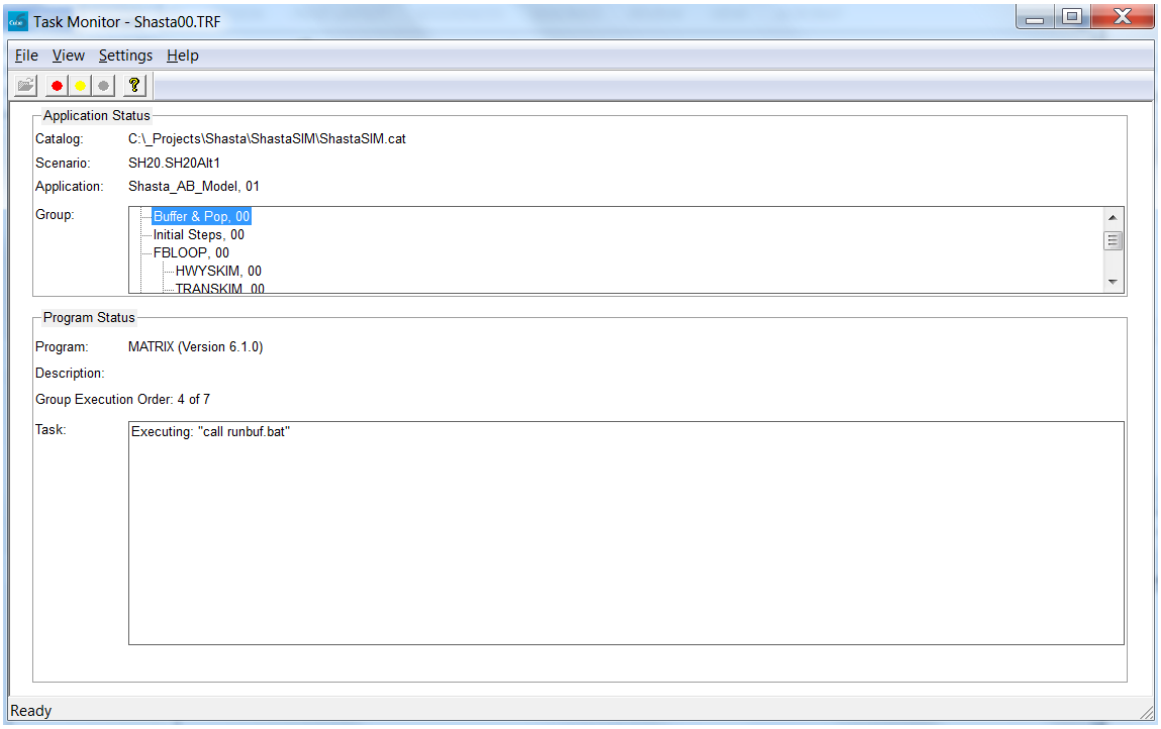


i. Click Run…
ii. The following window will open:



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.

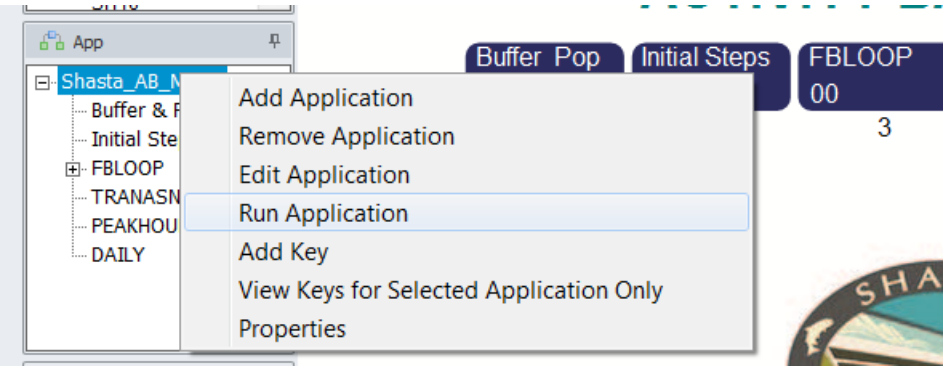
Figure 3: Task Monitor Window



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.***

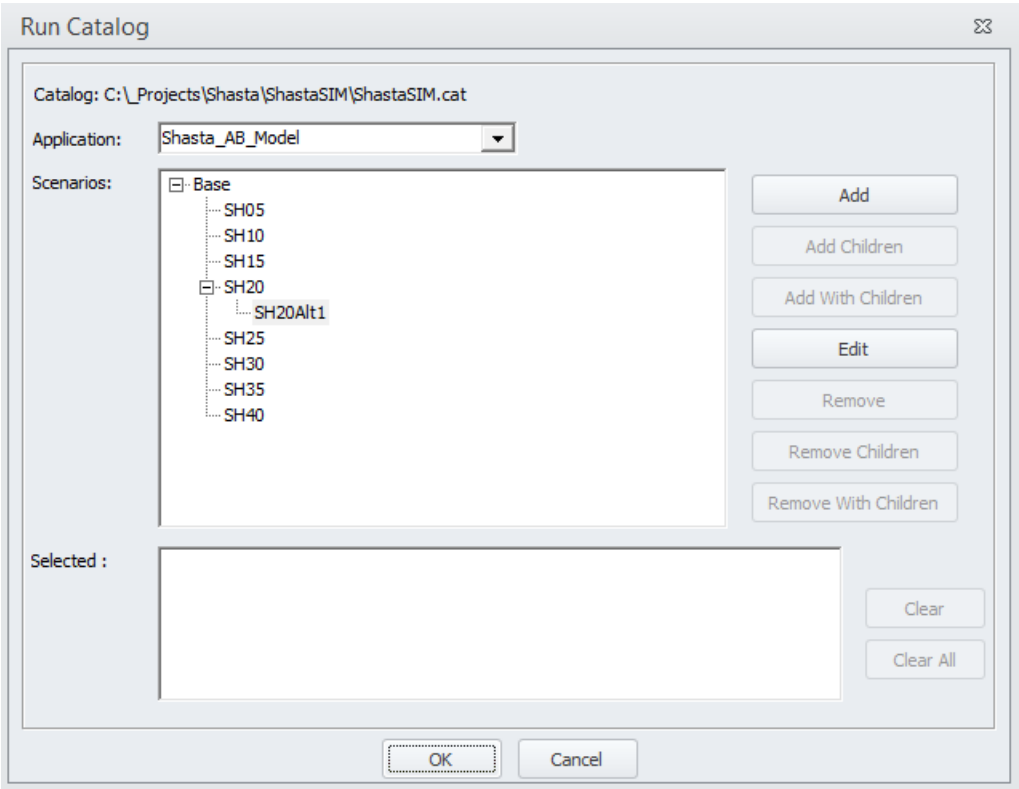
b. **Method 2**: With ShastaSIM open in CUBE, right-click on **Shasta_AB_Model** in the Applications Pane and select Run Application from the drop-down menu (see **Figure 4**)

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

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/pastel/RT_TDM.htm.

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, 2015, 2020, 2025, 2030, and 2035.

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 24 model files (discussed in chapter 2) the model user would typically modify.

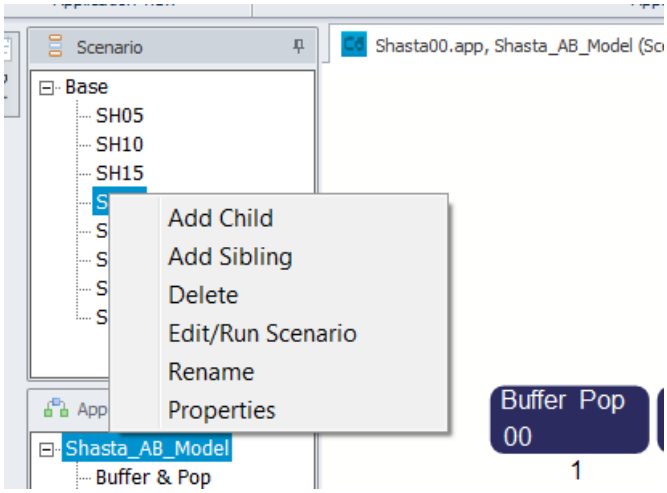
The following rules should be observed when creating scenarios in ShastaSIM:

- ***"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.

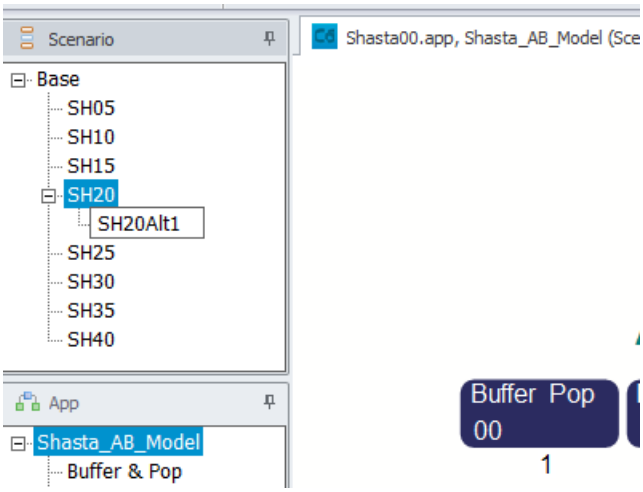
Create New Scenario and Populate Directory

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

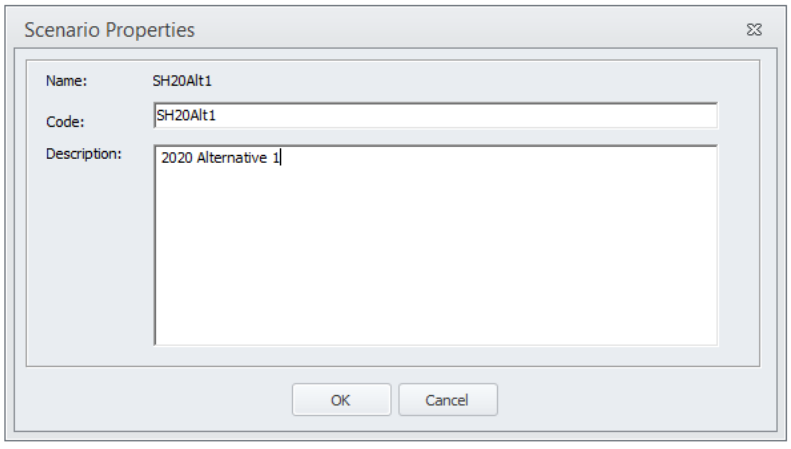
1. Open **ShastaSIM.cat** by either:
   a. Double clicking on the file in the Catalog Directory
       ShastaSIM.cat, or
   b. Opening CUBE and opening the catalog file from within CUBE
       Open… Ctrl+O
      If the scenario pane on the left is too small to see all scenarios, it can be stretched.
2. Right click on the year for the new scenario (for example SH20) and click "Add Child".



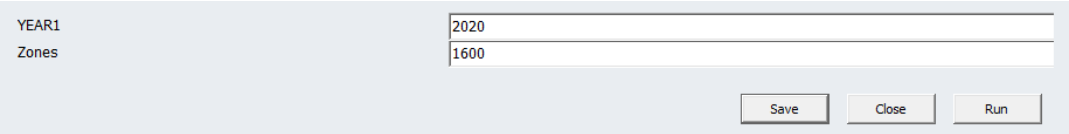
3. Give the scenario a simple, but descriptive name (for example SH20Alt1) and hit return.



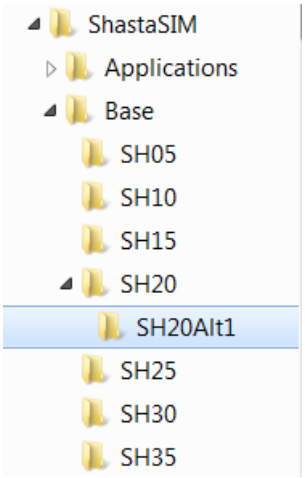
4. The “Scenario Properties” dialog box will appear.



5. Next to "Code:" input the same scenario name as above. ***A description can be entered in the appropriate box, but 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 24 (or 25 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.

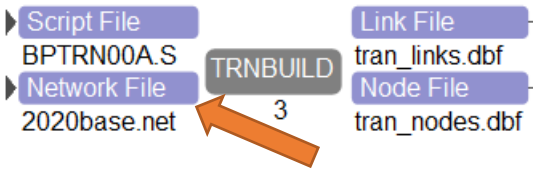
As stated above, the three files most likely to be modified for a new scenario include the base network (base.net), land use input (parcel_update_allocHH.csv), and transit network (base.lin) files. Each of these three files has specific steps for updating, while some of them have multiple ways of updating. 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:

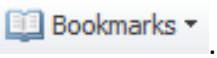
1. Navigating to the scenario directory in Windows Explorer and double clicking the file, or;
2. With CUBE already open:
    a. Using file/ open to open the network
    b. Double-clicking on the network file box from within an application, in the **MAPS/APPLICATIONS WINDOW** (see Figure 1)



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 16). 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.

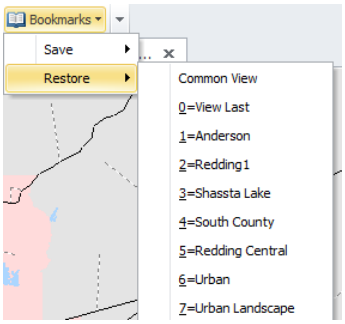
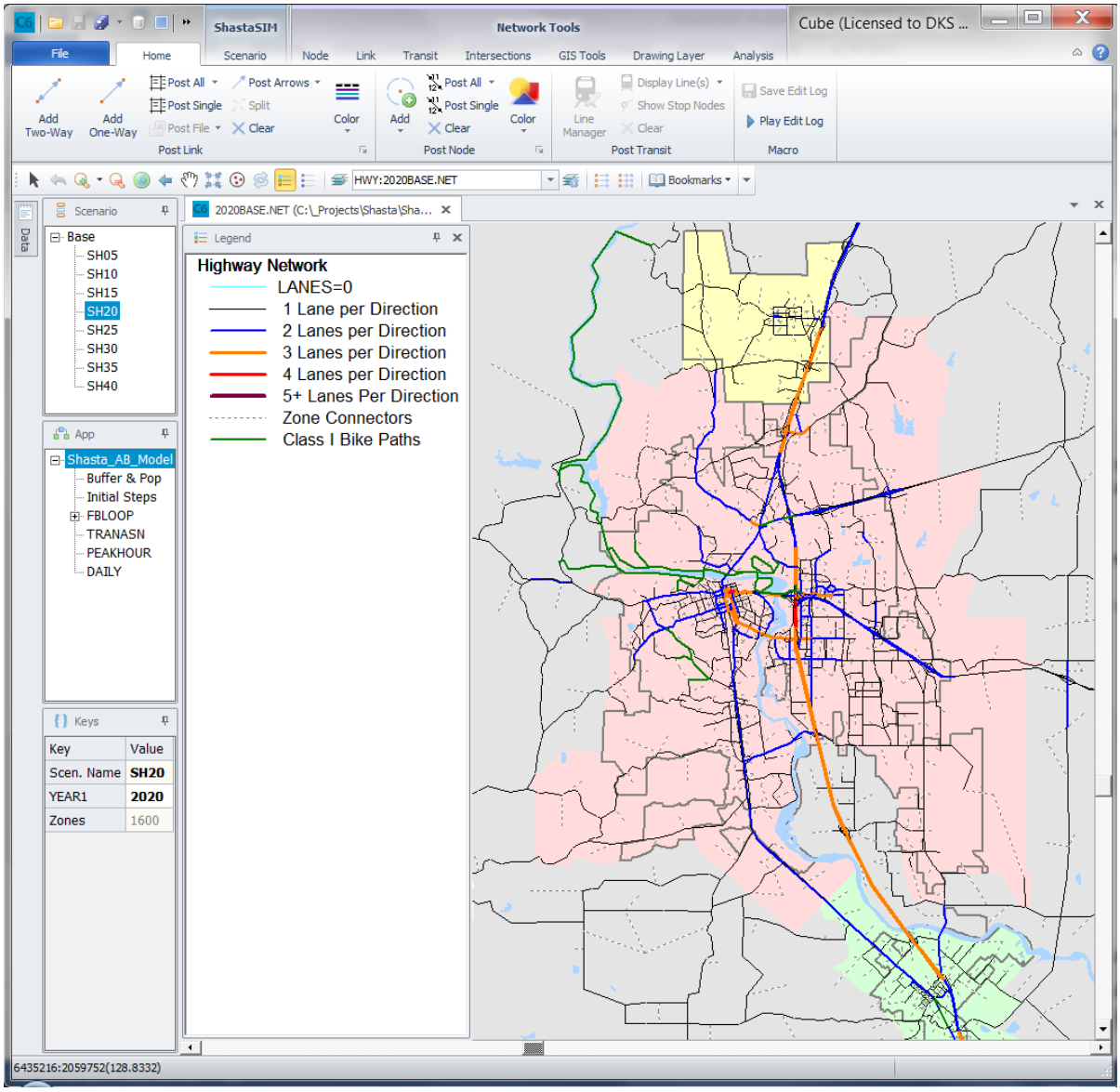
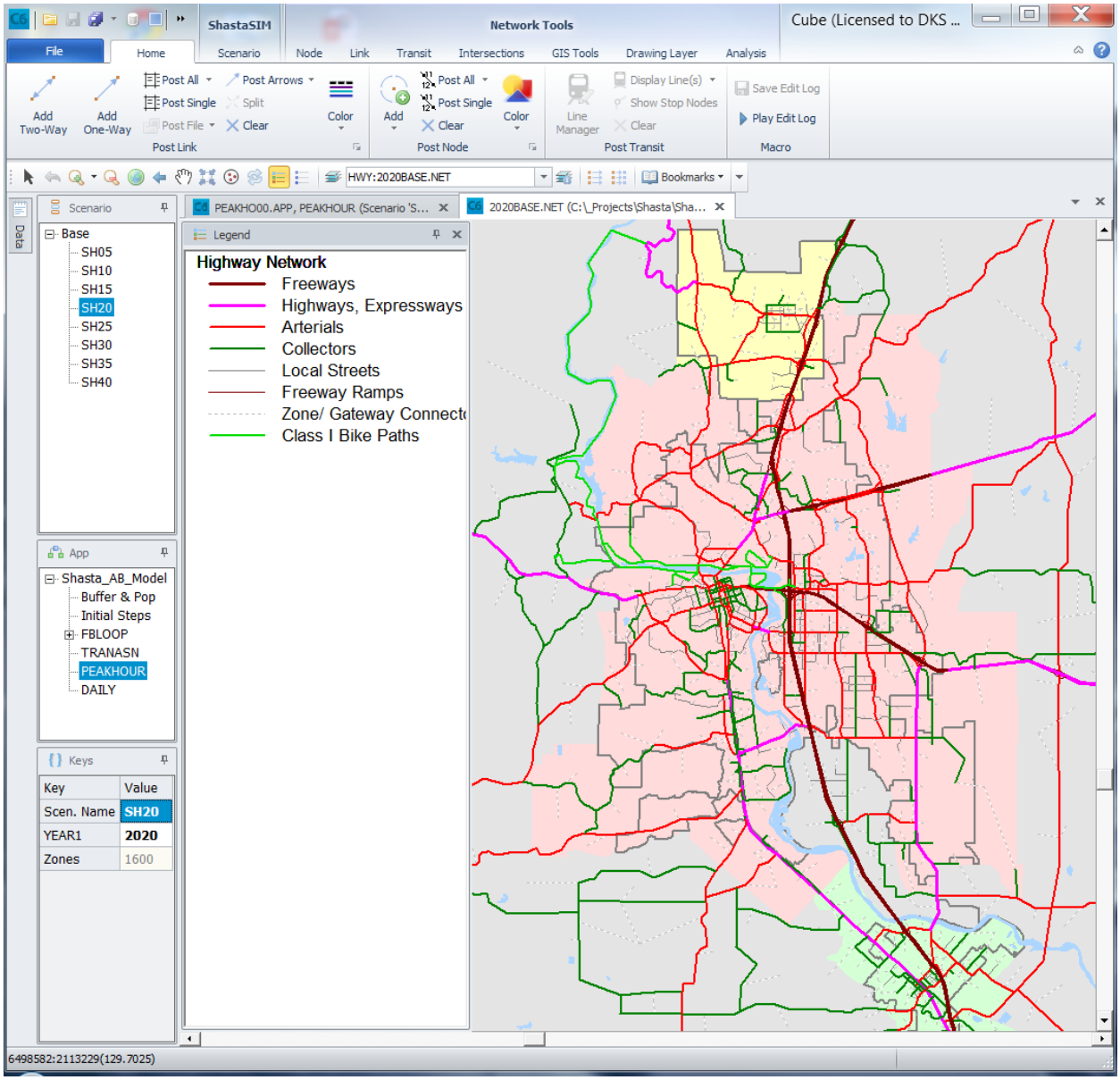


Figure 6: Base Roadway Network Lanes in CUBE



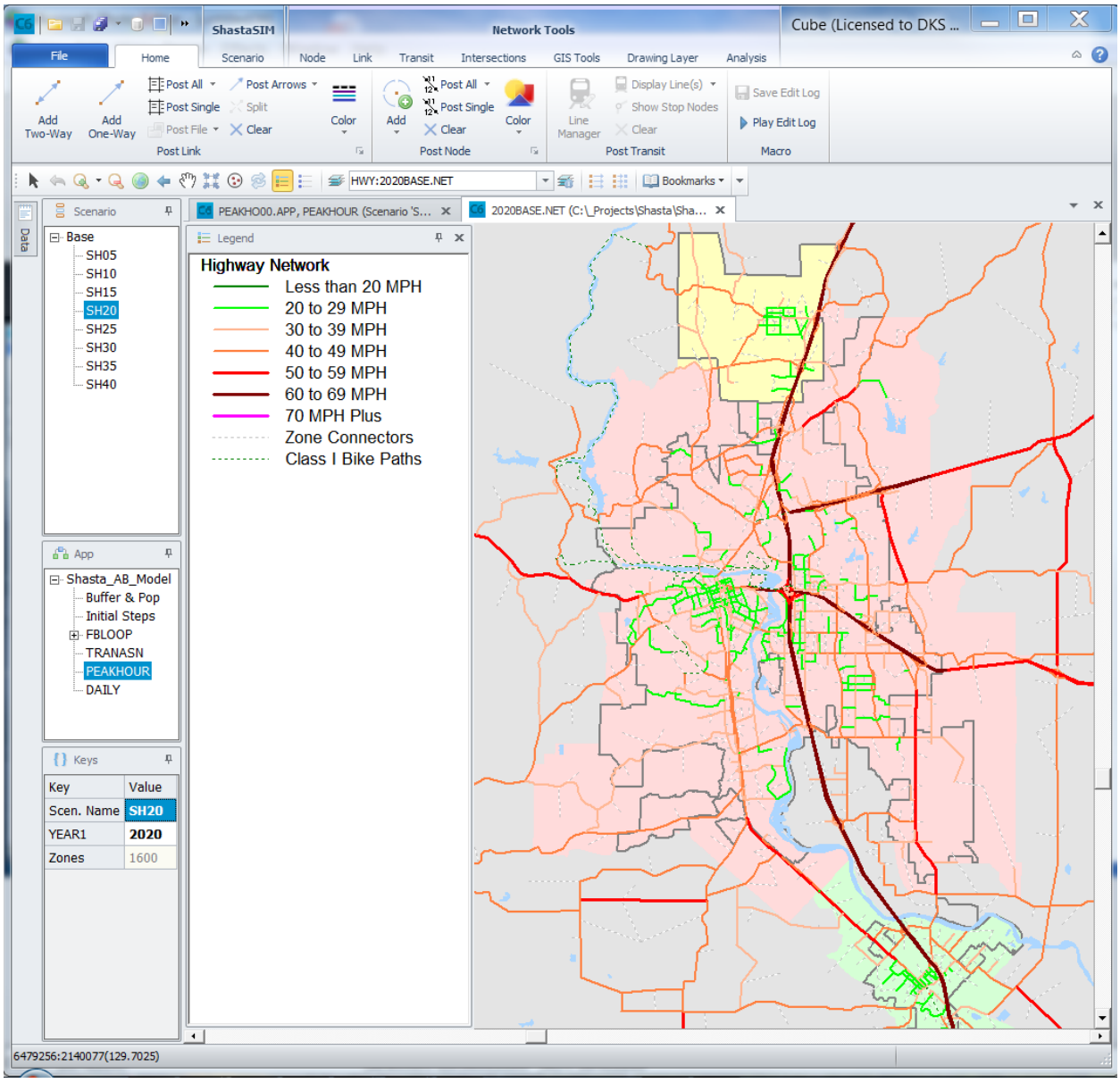
In **Figure 7** (page 17), roadways are shown color coded by facility type. Freeways (FACTYP = 1) are thick dark red, Highways and Expressways (FACTYP = 2 and 3) are magenta, arterials (FACTYP = 4) are red, Collectors (FACTYP = 5) are dark green, Local Streets (FACTYP = 6) are solid grey, Freeway Ramps (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



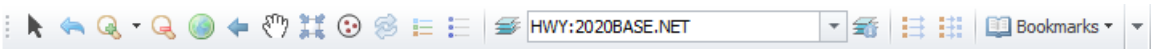
In **Figure 8**, roadways are shown color coded by speed. Slower speeds are in shades of green, medium speeds are in shades of orange, and higher speeds are in shades of red and magenta. Zone connectors and bicycle paths are dashed grey and green, respectively.

Figure 8: Base Roadway Network Speed in CUBE



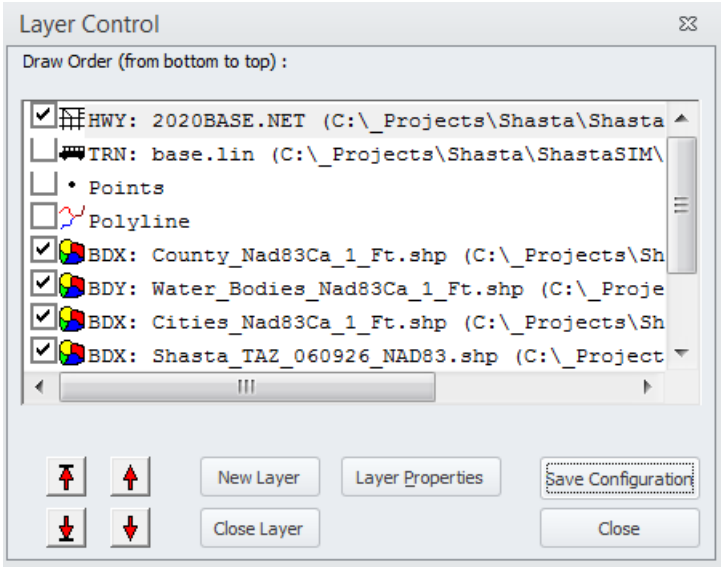
Quick Access Toolbar

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 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

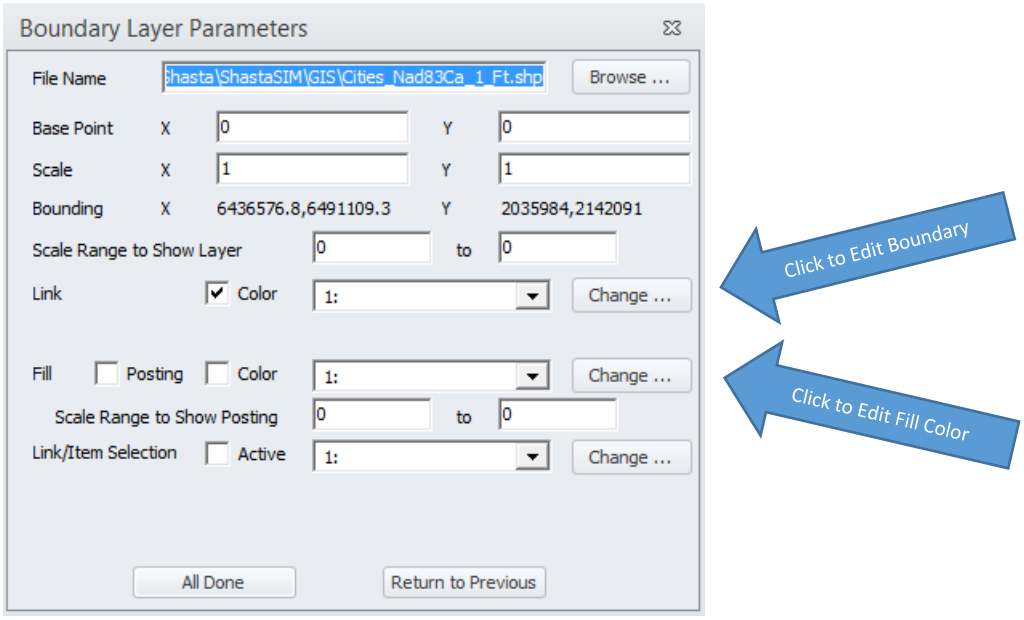


Figure 11: Boundary Layer Link Color Specifications

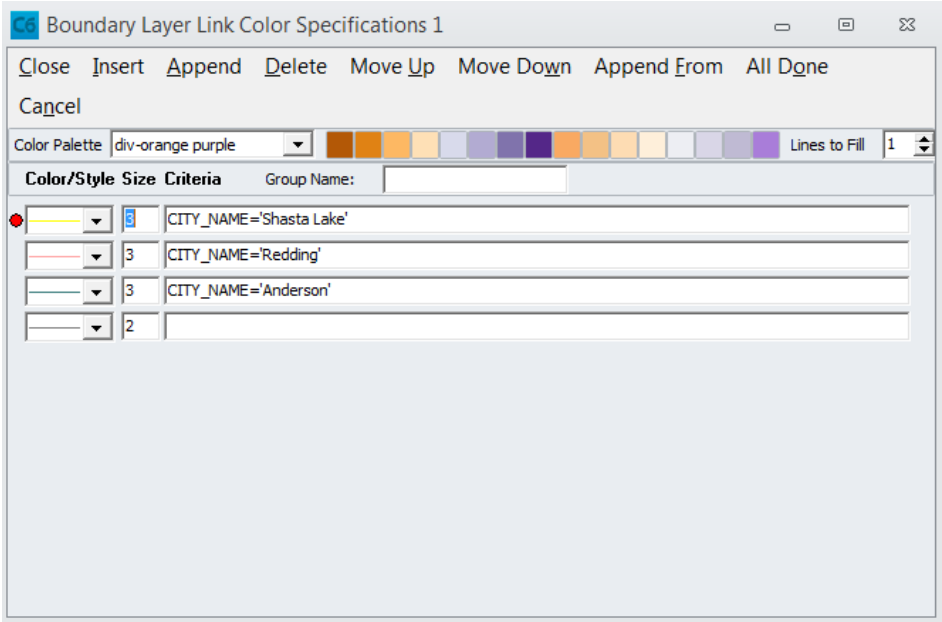
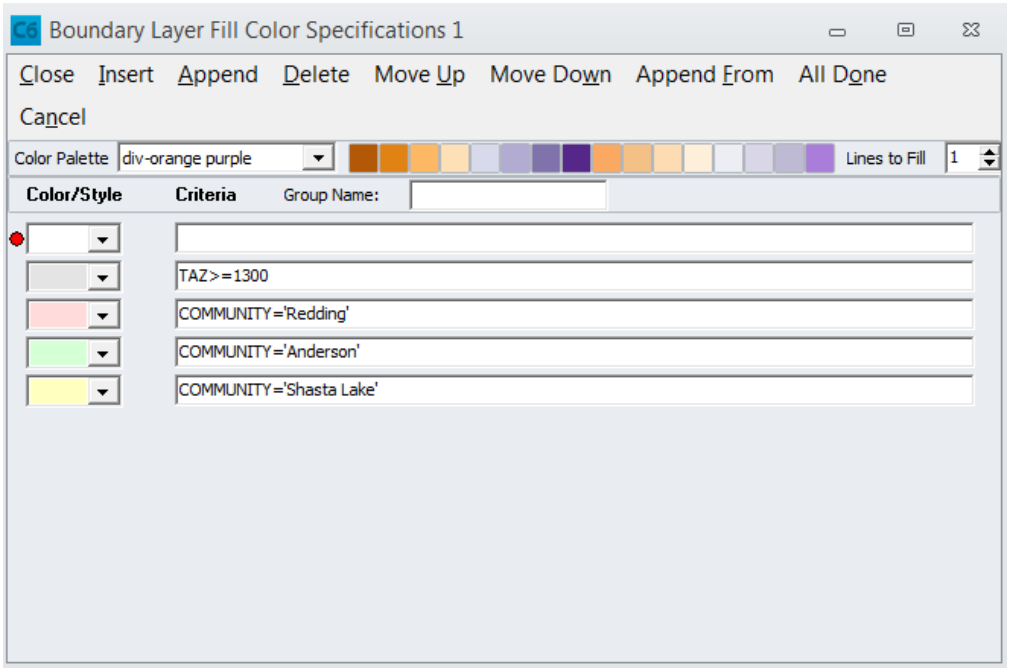


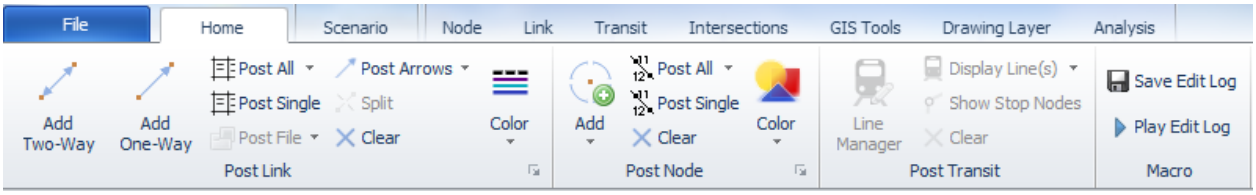
Figure 12: Boundary Layer Fill Color Specifications



Home Ribbon

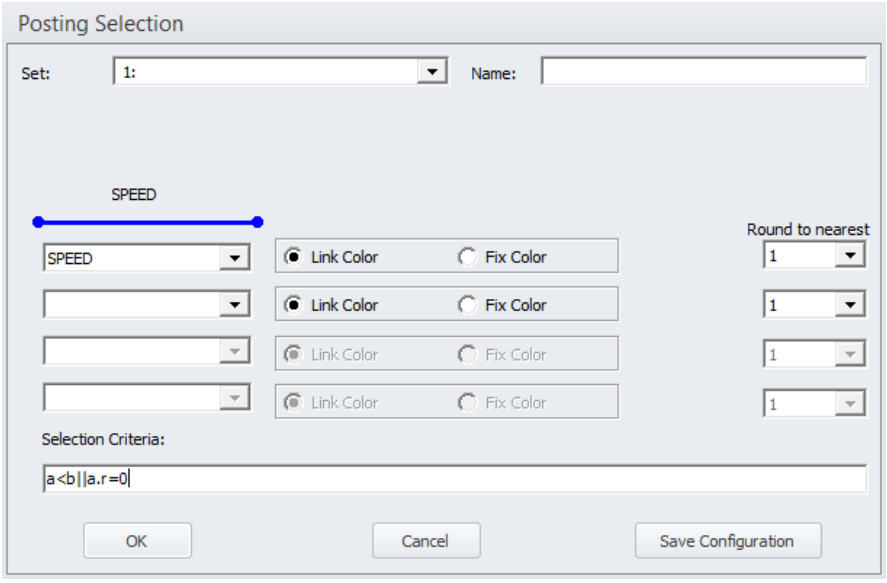
The **HOME** ribbon contains many useful tools for network viewing and editing.

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

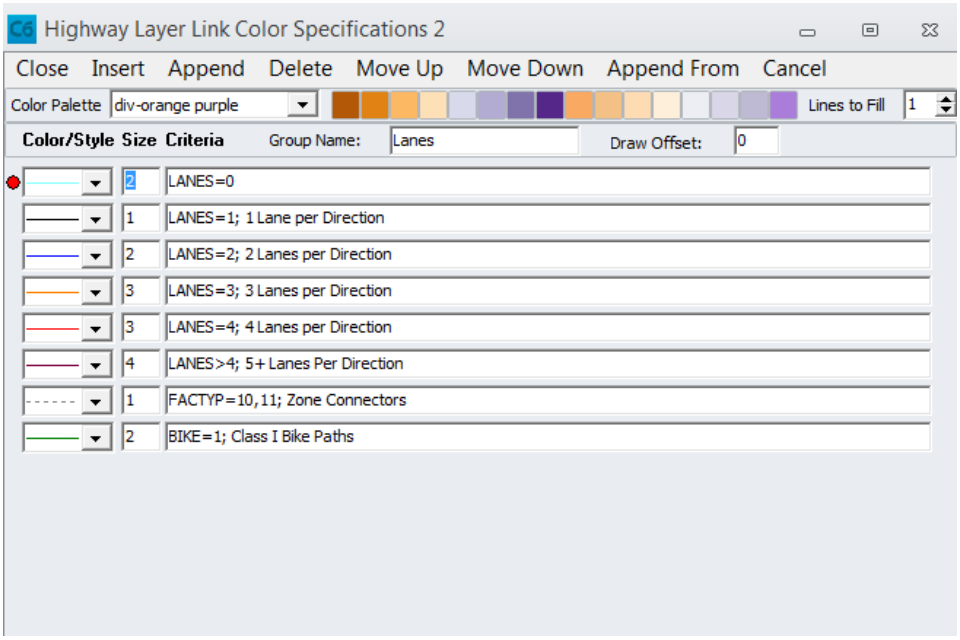


4. If desired, one-way links can be identified by clicking Post Arrows.

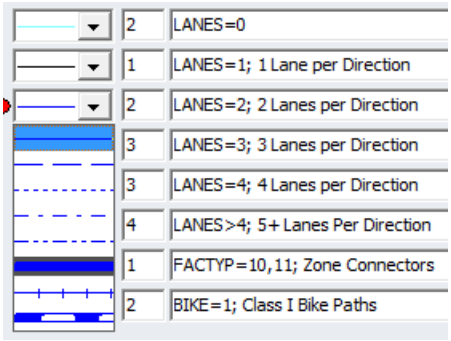
5. Link color settings can be changed by clicking Color.

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

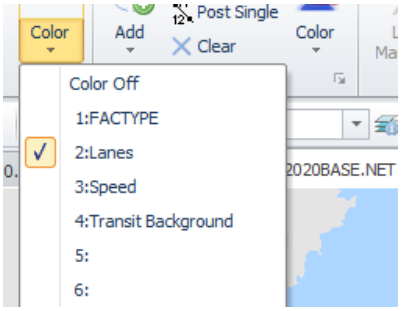
Figure 15: Highway Layer Link Color Specifications



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.



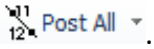
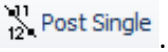
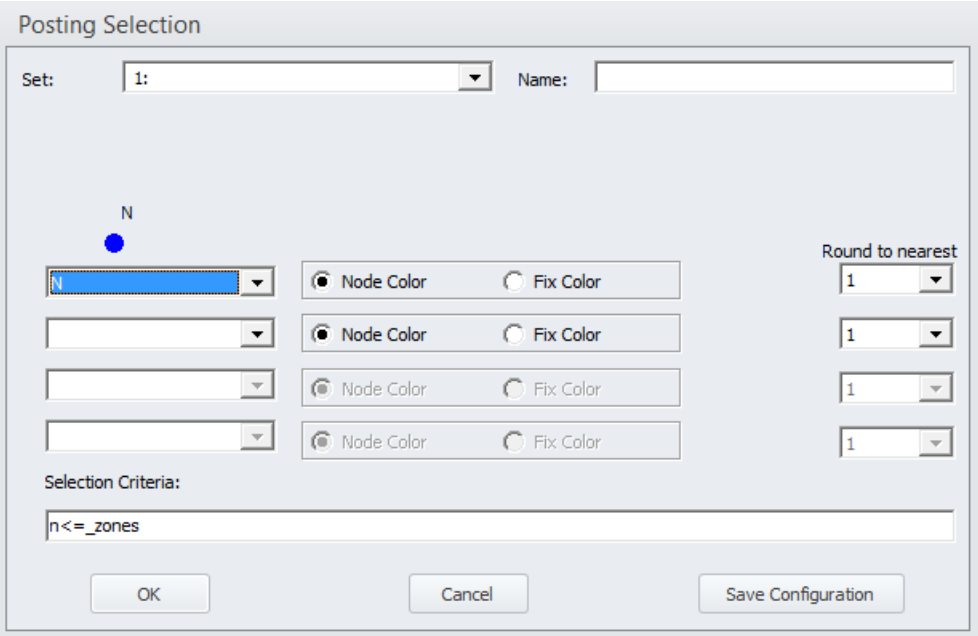
6. Node attributes on all nodes can be posted on links by clicking  .
7. Node attributes on particular nodes can be posted by clicking  .
8. Both of these selections bring up this window (**Figure 16**) in which a variable can be selected for posting. Variables can be posted in the color of the node 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

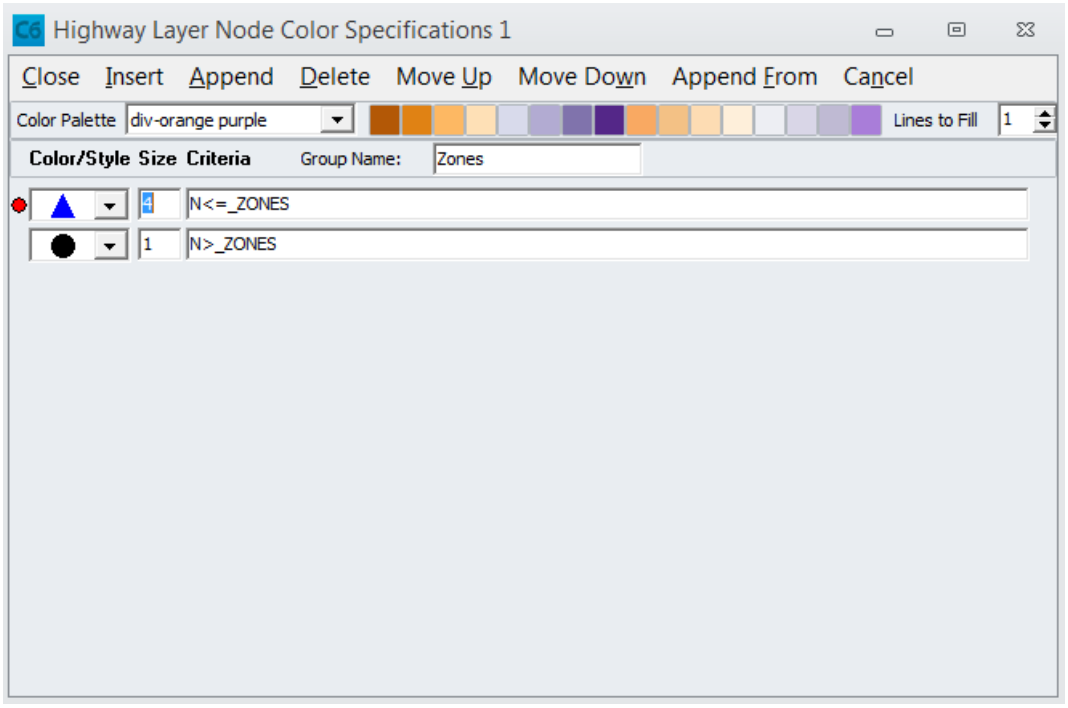


9. Node color settings can be changed by clicking 

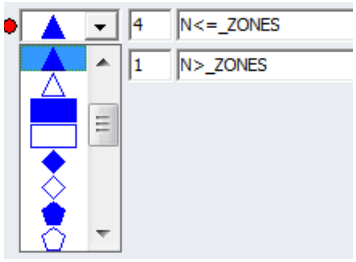
.

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

Figure 17: Highway Layer Node Color Specification

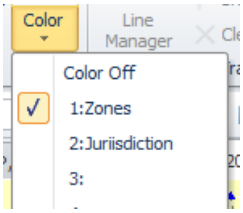


In this window, the color and marker shape can be changed by clicking on the colored shapes. Additional node styles can be inserted or appended, and definitions (including legend text) can be set for nodes with different characteristics – such as jurisdiction.



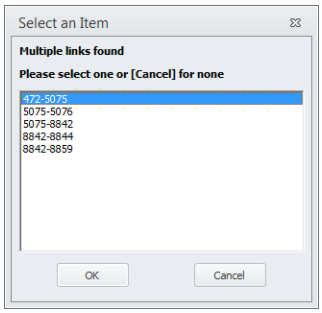
   b. Clicking 

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

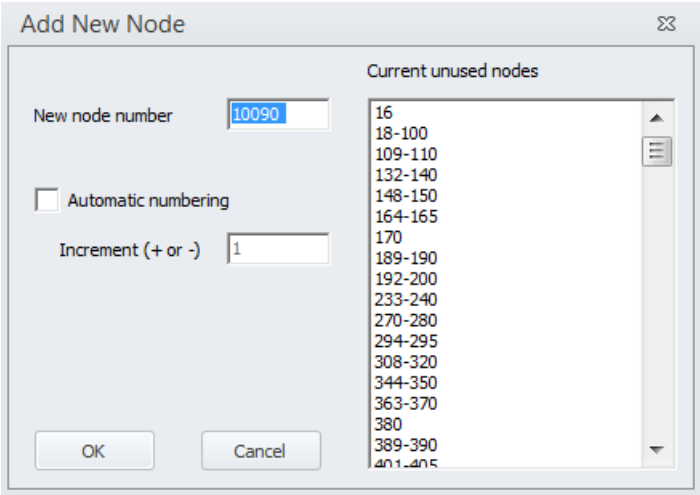
Add Links

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

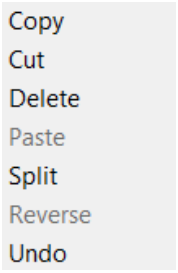
Highway Links

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.



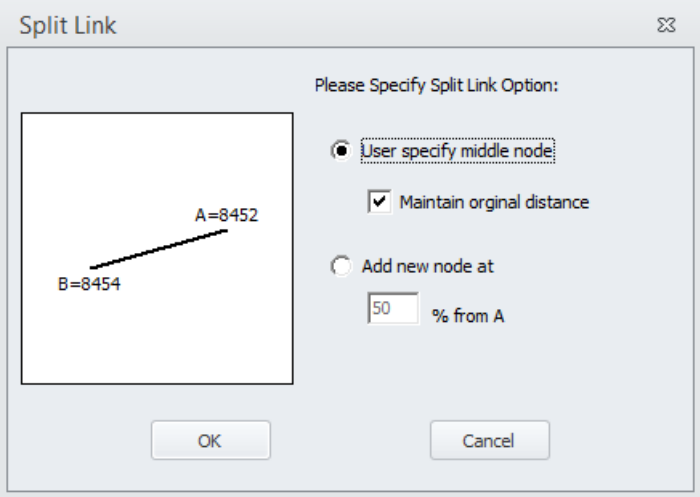
2. Next select **copy** from the resulting box, then right-click again anywhere in the blank space of the map, and select **paste** from the resulting box. Finally, select the desired A node and B node for the new link. If either end of the new link is not at an existing node, the program will prompt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

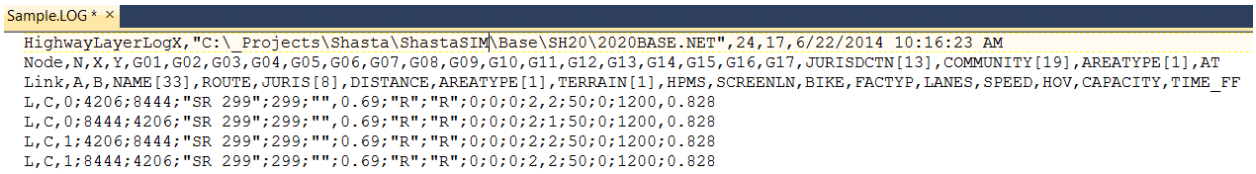
Links can easily be deleted by:

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



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.

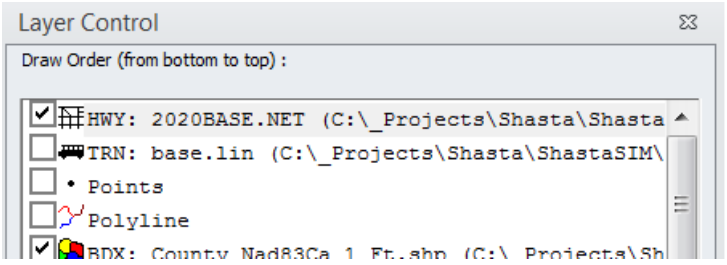
Figure 22: Transit Line File in TextPad Text Editor

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
```

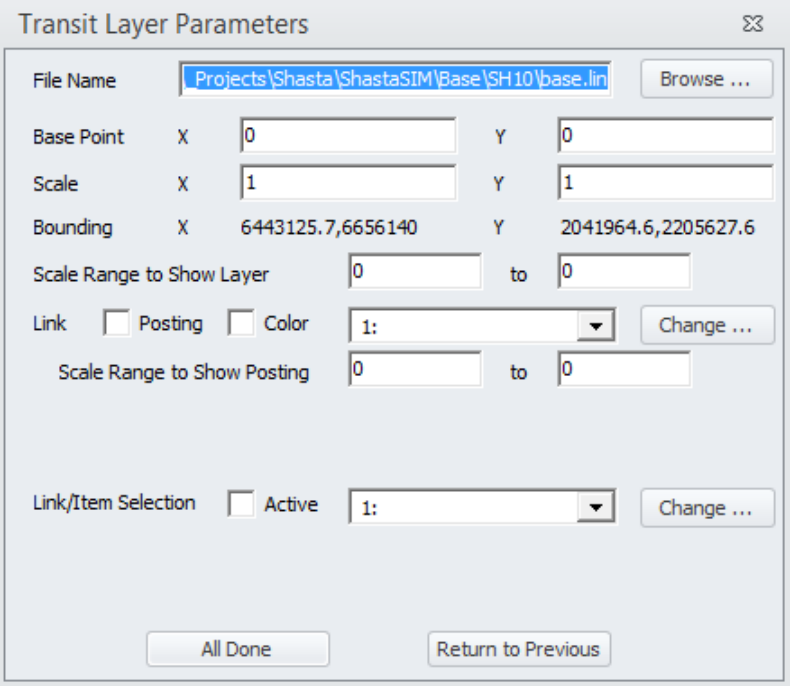
To load a transit file with the scenario network in CUBE (if the transit line file is not already loaded with the **DEFAULT.VPR** file), do the following:

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



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

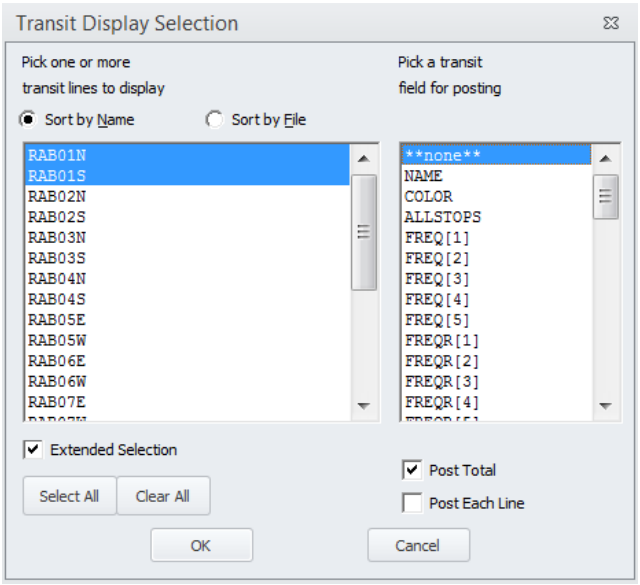
Figure 23: Transit Layer Parameters Window



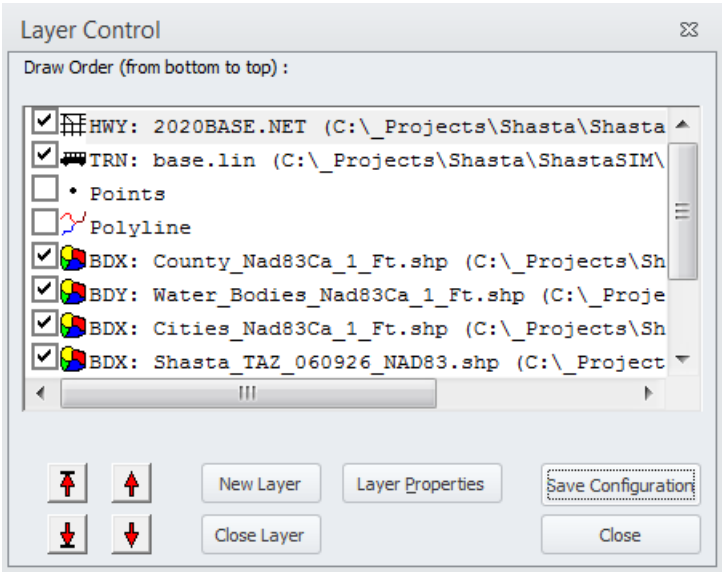
3. Select the appropriate base.lin file in the appropriate directory and click All Done.
4. The transit lines should all show up on the map, as shown in **Figure 26**. With the transit line file open, any links split while editing the transportation network will result in the transit line file being updated as well.

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



5. 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.



6. 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.
7. 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**).

8. 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

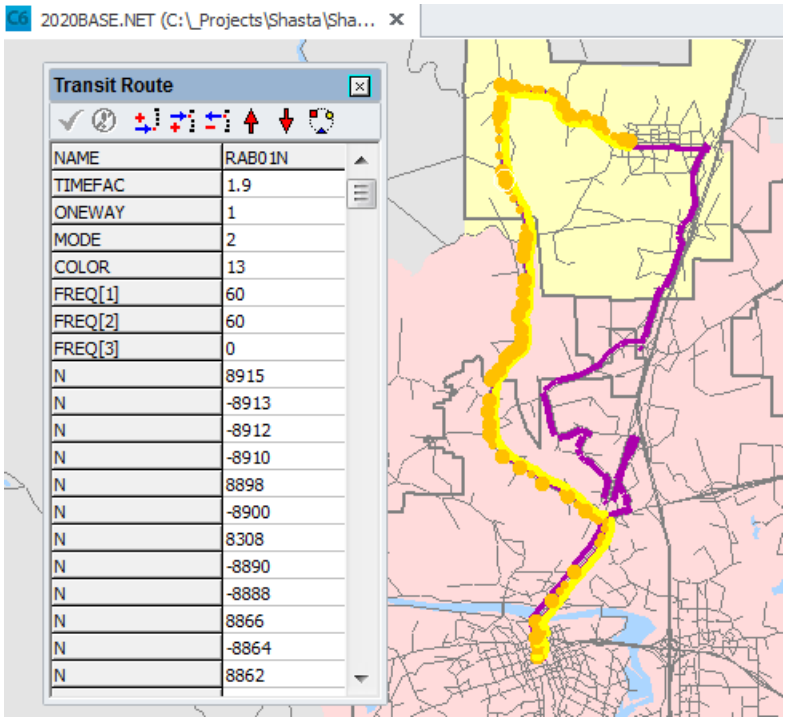
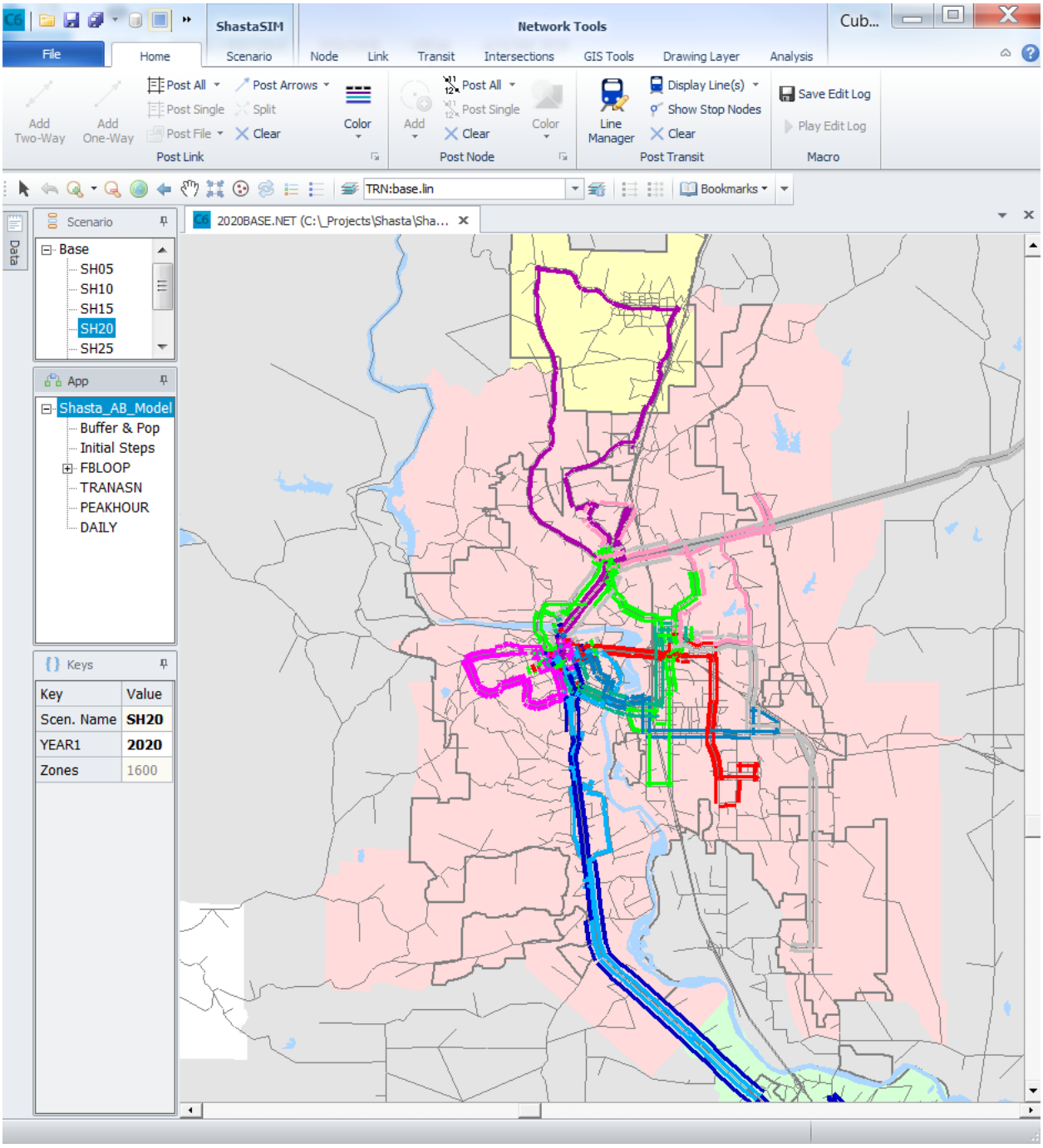


Figure 26: Transit Network Viewing in CUBE

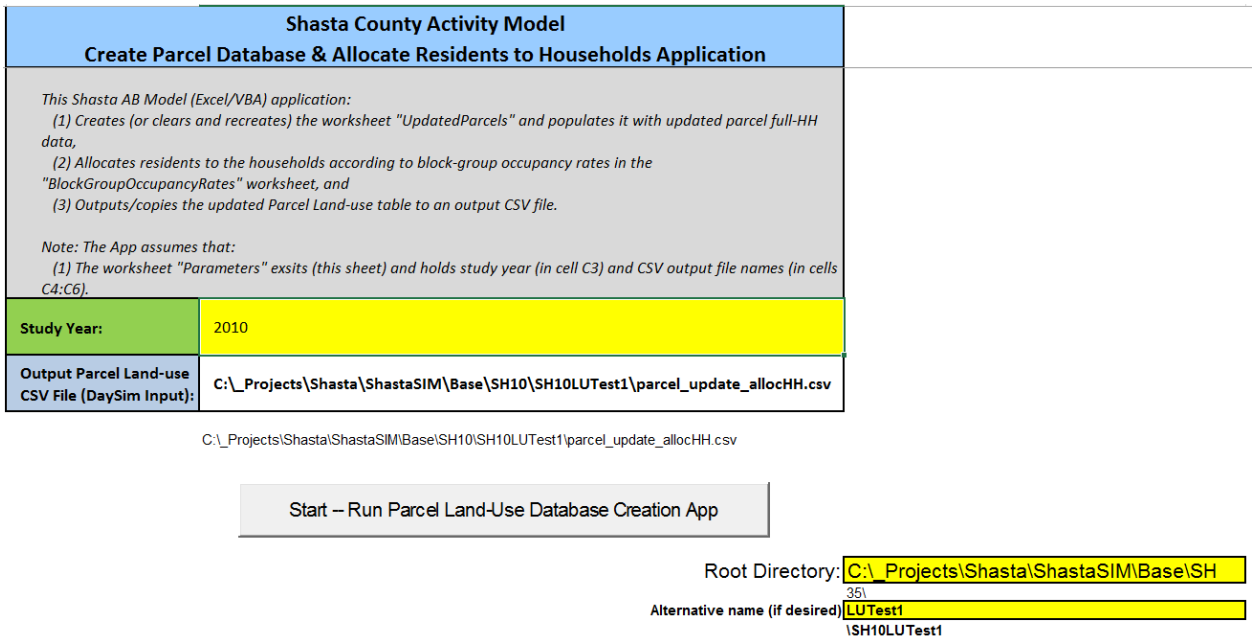


7. LAND USE INPUTS

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. This macro-enabled spreadsheet has been modified to estimate preliminary Strategic Growth Area (SGA) land use shifts in the city of Redding and will be similarly be used during the RTP process for SGA's in other jurisdictions. *Currently, the use of SGA parameters and related steps is not part of this model, but will be in a future model update, pending approval by the SRTA Board of Directors of the 2015 Regional Transportation Plan in early 2015.*

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 45, **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.

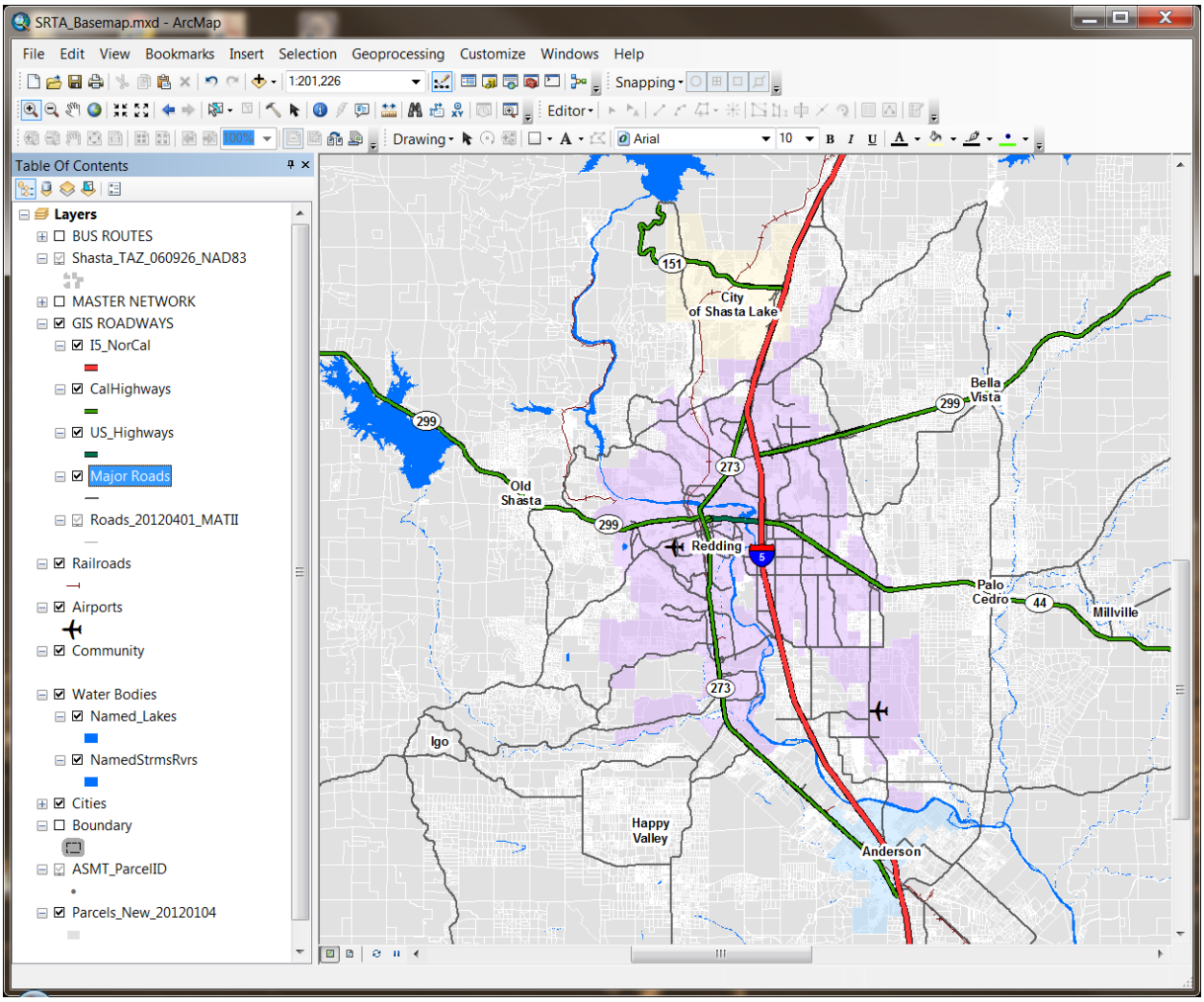
Parcel_Update_AllocHH.csv

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.

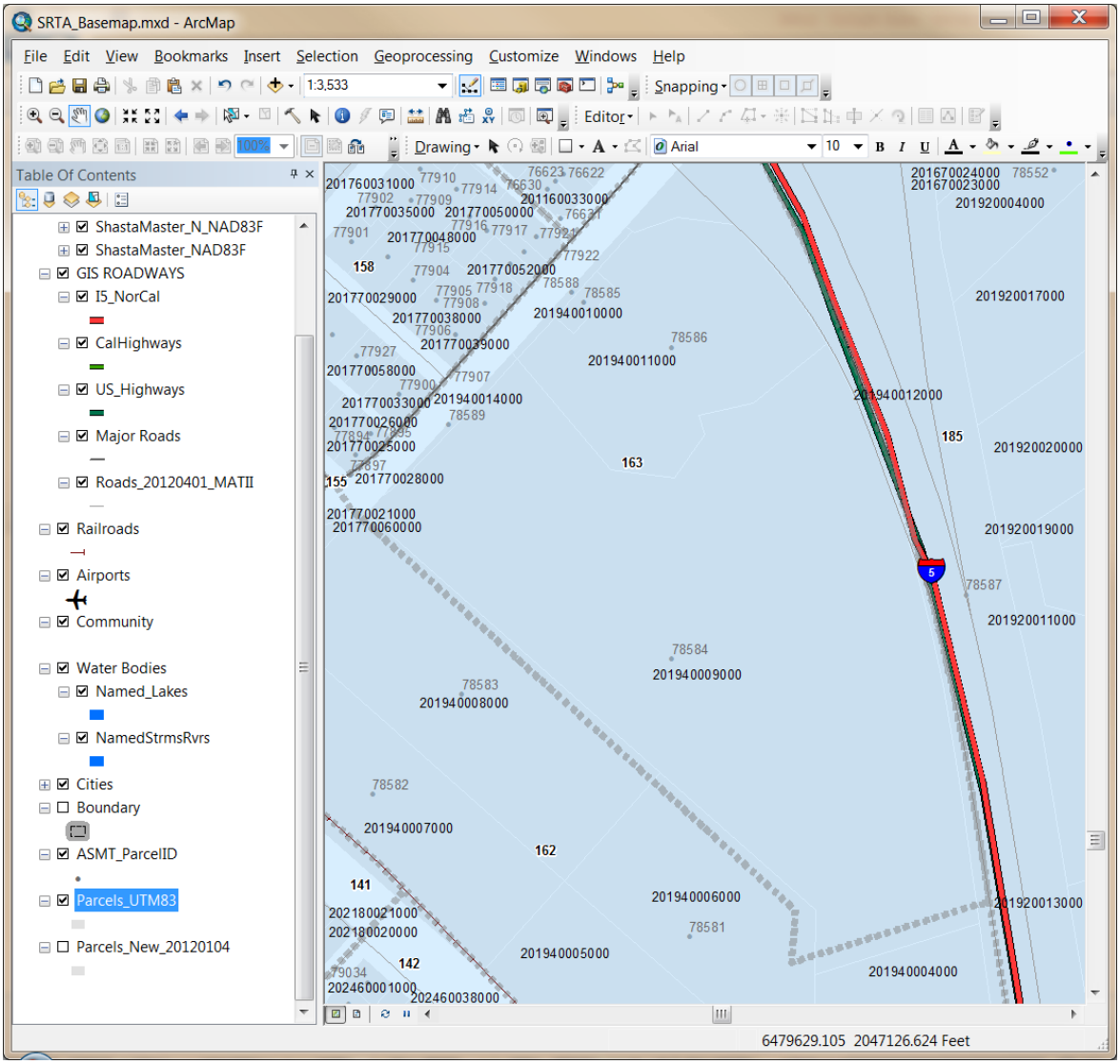
Figure 28: SRTA_BASEMAP.MXD in ArcGIS



b. 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 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 3 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-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 forecasts 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
9. Make sure the new file is located in the correct directory
10. Open up ShastaSIM.cat and run the model

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

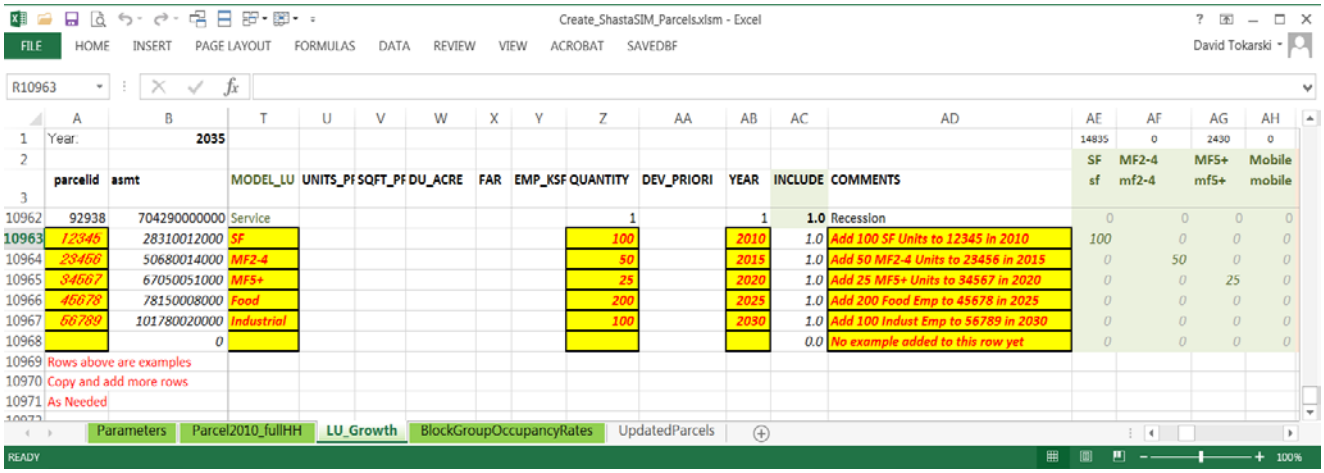
FIELD	DESCRIPTION
Parcelid	parcel ID number
xcoord_p	X coordinate – state plane feet
ycoord_p	Y coordinate – state plane feet
sqft_p	Area – square feet
taz_p	TAZ number
block_p	census block
SFDU	single family dwelling units on parcel
MF2_4DU	multi-family (2-4 units) dwelling units on parcel
MF5+DU	multi-family (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 13**. 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 eight 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

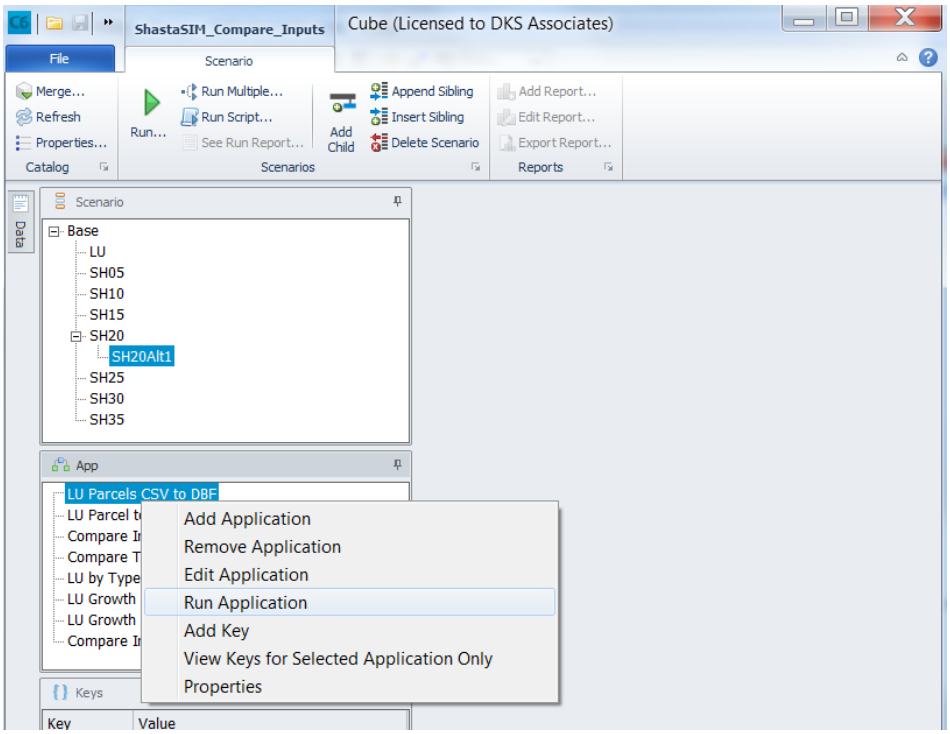
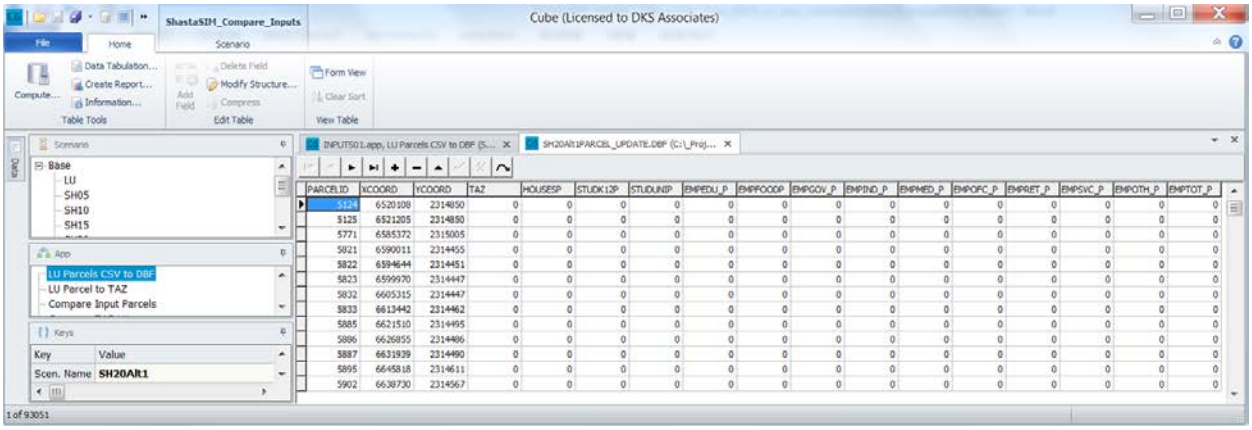
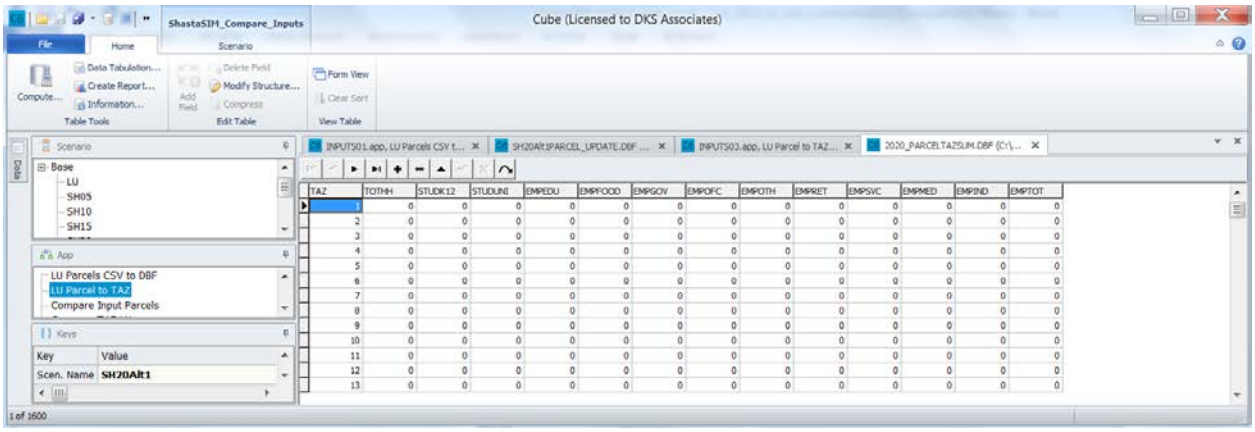


Figure 34: Parcel_Update File Fields



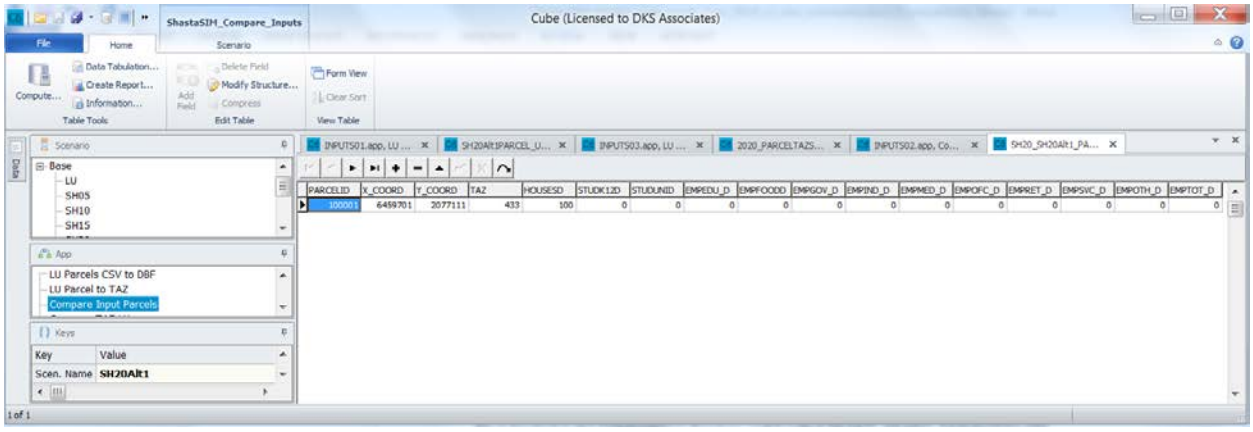
LU Parcel to TAZ: This module takes the .DBF file from the previous module and aggregates the households, students, and employment to traffic analysis zones (TAZs). The resultant .DBF file is located in the COMPARE\LU directory and is called **{SCENARIO_CODE}_PARCELTAZSUM.DBF**.

Figure 35: TAZSUM File Fields



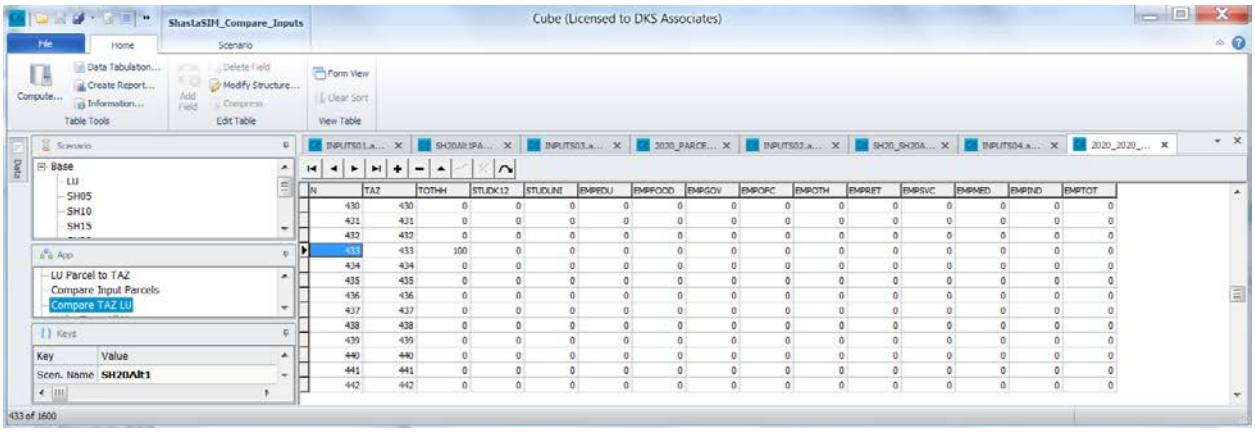
Compare Input Parcels: This module compares the land use inputs for two scenarios. YEAR1 is the later year or ""plus project"" scenario, while YEAR2 is the earlier year or ""no project"" scenario. Currently the scenarios are set up so that each YEAR1 is compared to the base 2010 scenario (YEAR2), but 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



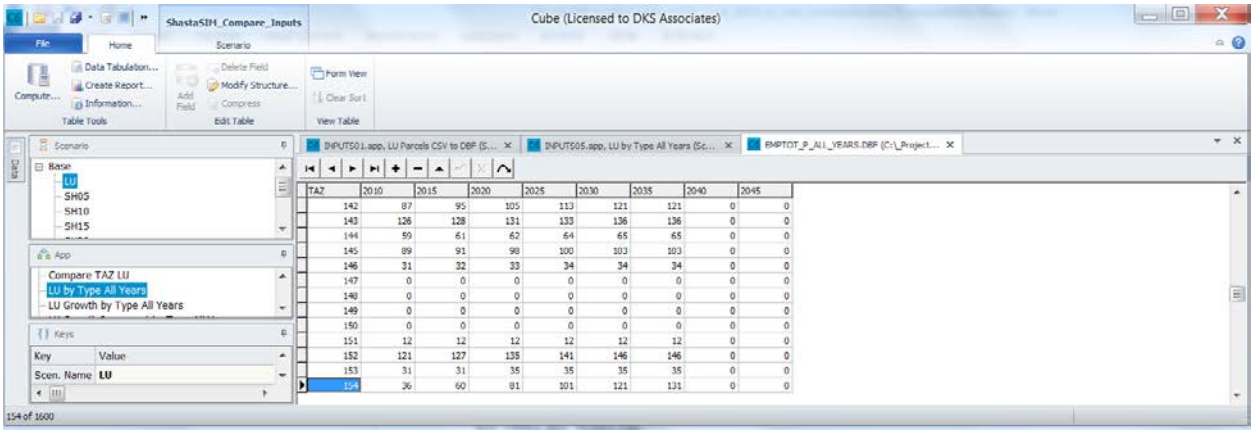
Compare TAZ LU: This module compares the land use totals by TAZ for two scenarios. Similar to the previous module, this one can be set up to compare future scenarios to the 2010 scenario or to other scenarios. It can also be set up to compare a "plus project" to a "no project" scenario. The resultant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

Figure 37: Compare TAZ File Fields



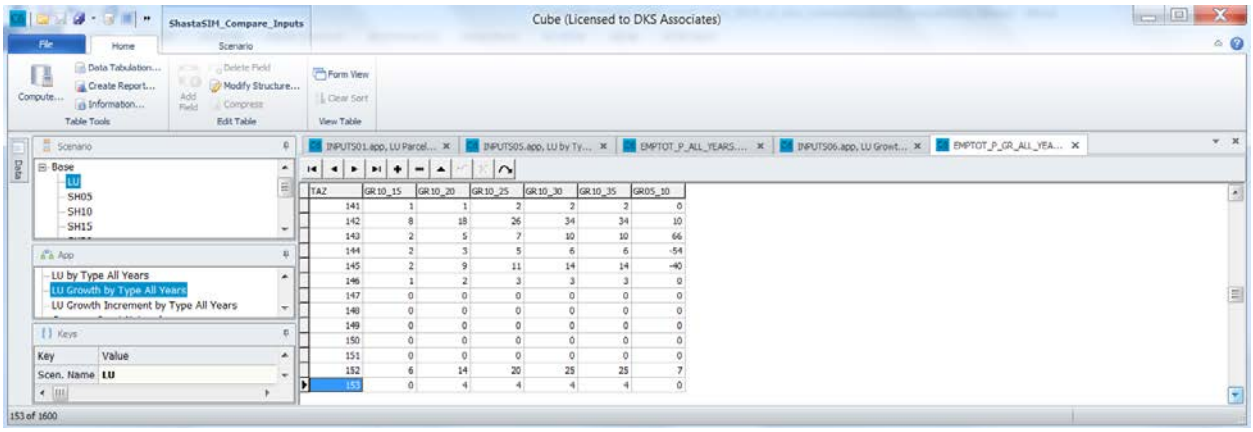
LU Growth by Type All Years: This module creates a .DBF file showing land use for all 5 year increments (2010-2035) for a selected land use category (households, students, each employment category). This module is only run for the "LU" scenario and the desired land use category is a Key that can be selected 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



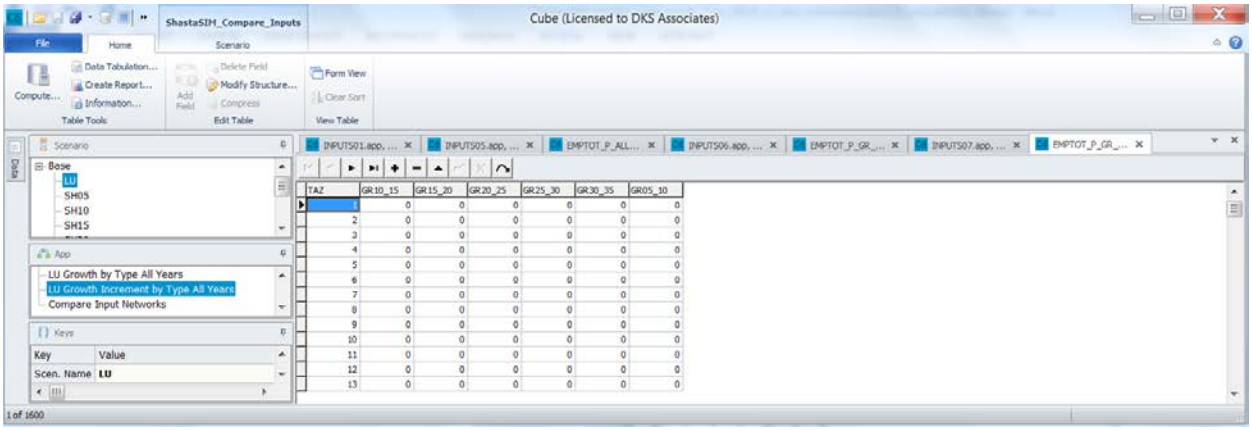
LU Growth by Type All Years: This module is similar to the previous one but the resultant .DBF file includes growth between 2010 and each other year. The resultant .DBF file is located in the COMPARE\LU directory and is called **{LU_TYPE}_GR_ALL_YEARS.DBF**.

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

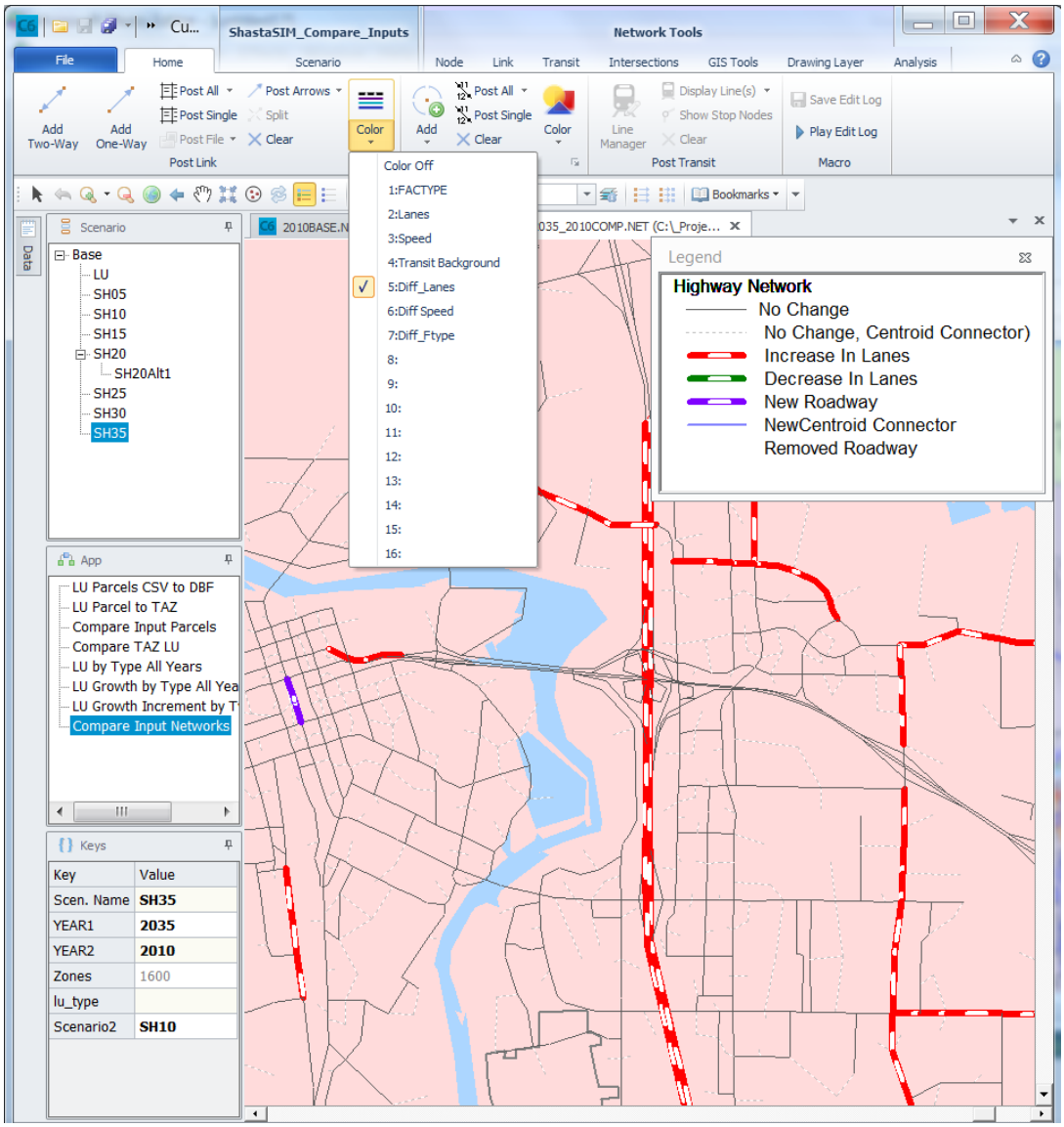


Compare Input Networks: This module compares the input roadway networks for two scenarios. Input base networks are located in each scenario directory. The resultant comparison network is located in the COMPARE\NETWORKS directory and is called **{YEAR1}_{YEAR2}COMP.NET**. From the application manager, 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"

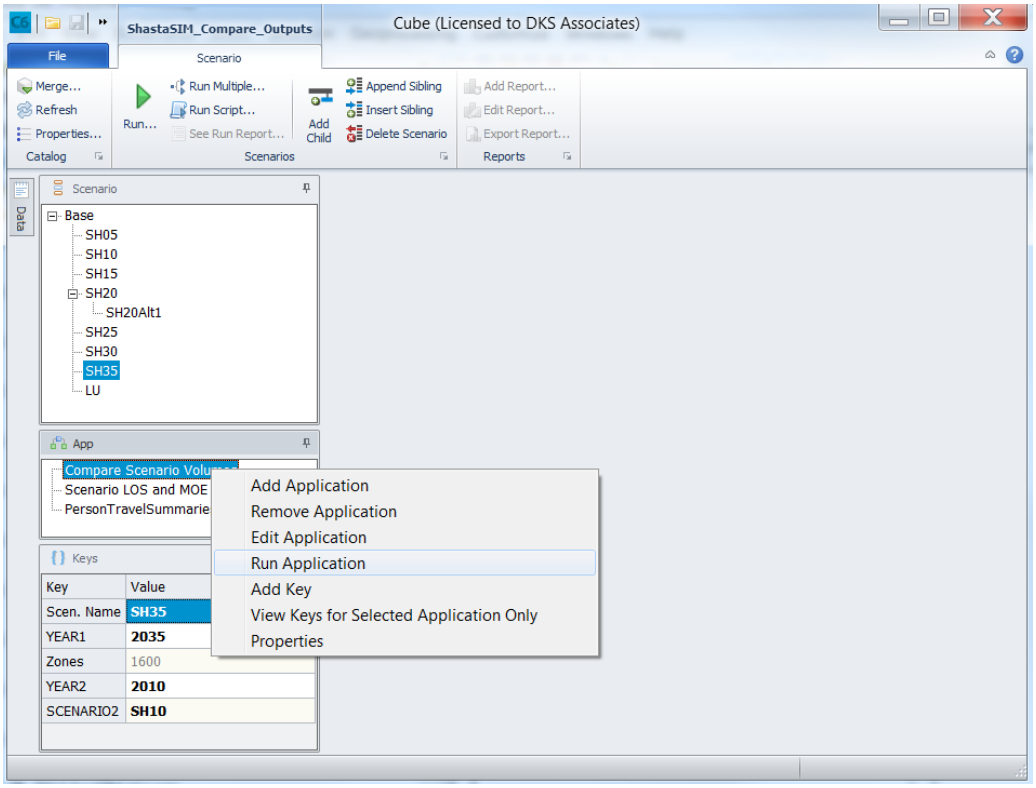
Figure 41: Compare Input Networks (Lanes)



Compare Outputs Catalog

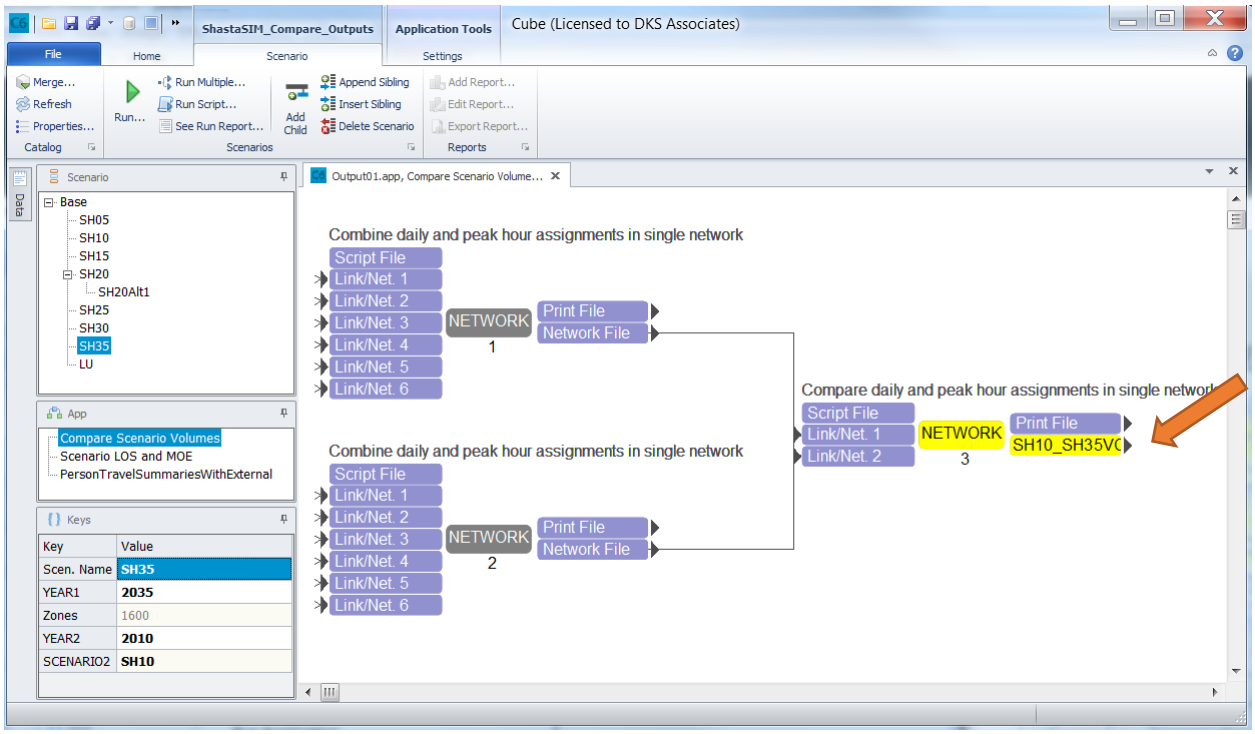
The **SHASTASIM_COMPARE_OUTPUTS.CAT** can be opened in CUBE using the same methods described on **page 13**. Opening the catalog provides a list of available applications to choose from in the Application Pane. Any of these applications can be run by right-clicking on them to bring up the Run Catalog 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.

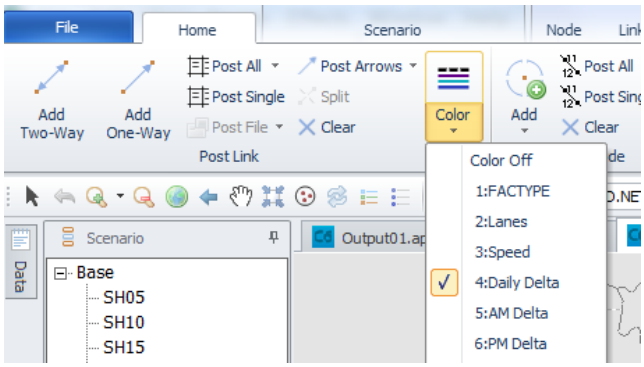
Figure 43: Compare Scenario Volumes Application



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 

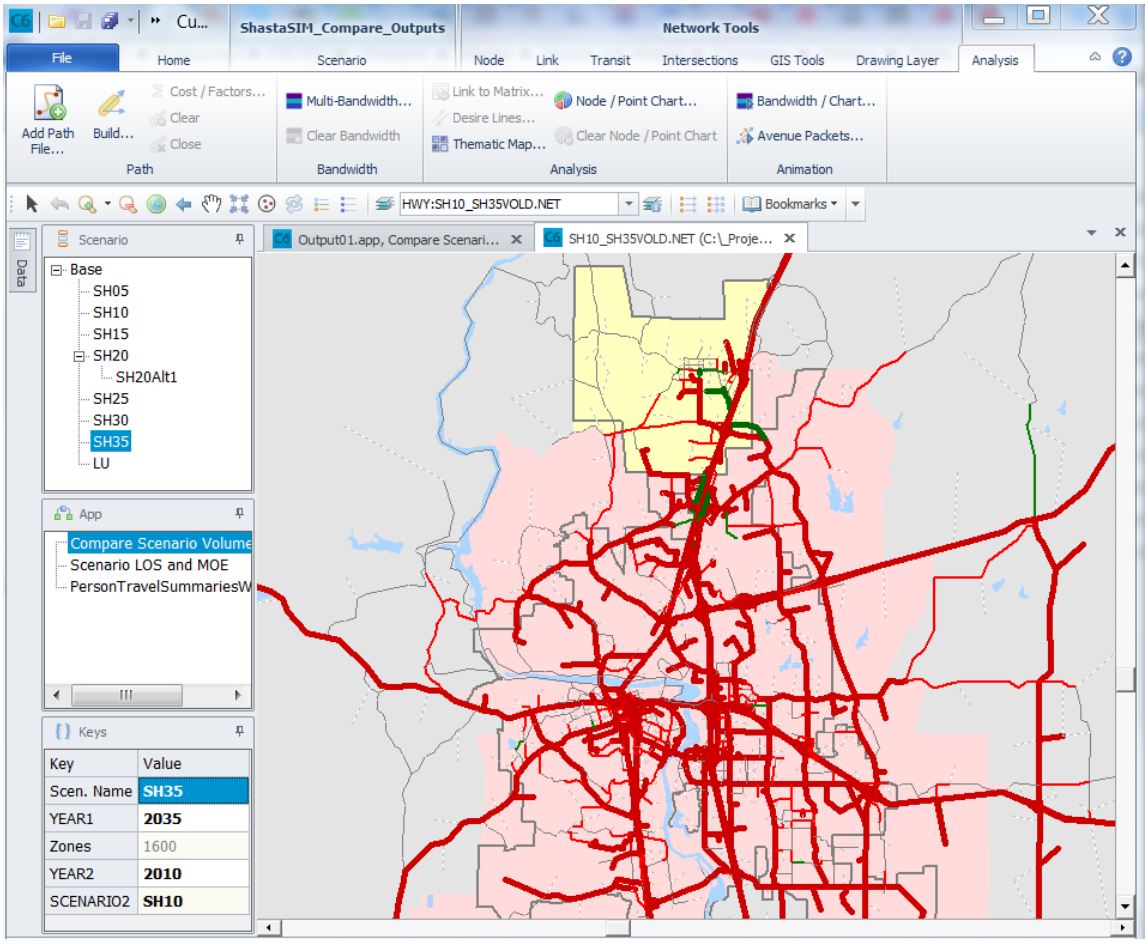
under the HOME tab, as shown in **Figure 44**.

Figure 44: CUBE Color Setting Choice



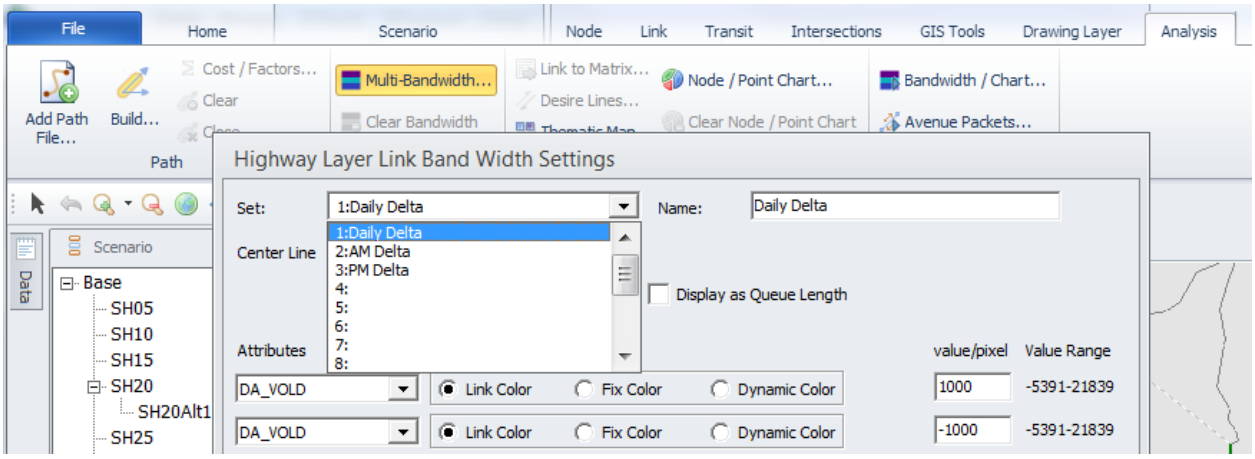
The network will be color coded by the daily volume "delta." Volume increases are red, volume decreases are green, and links with minimal volume change (less than 100 daily or 10 peak hour trips) are grey.

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

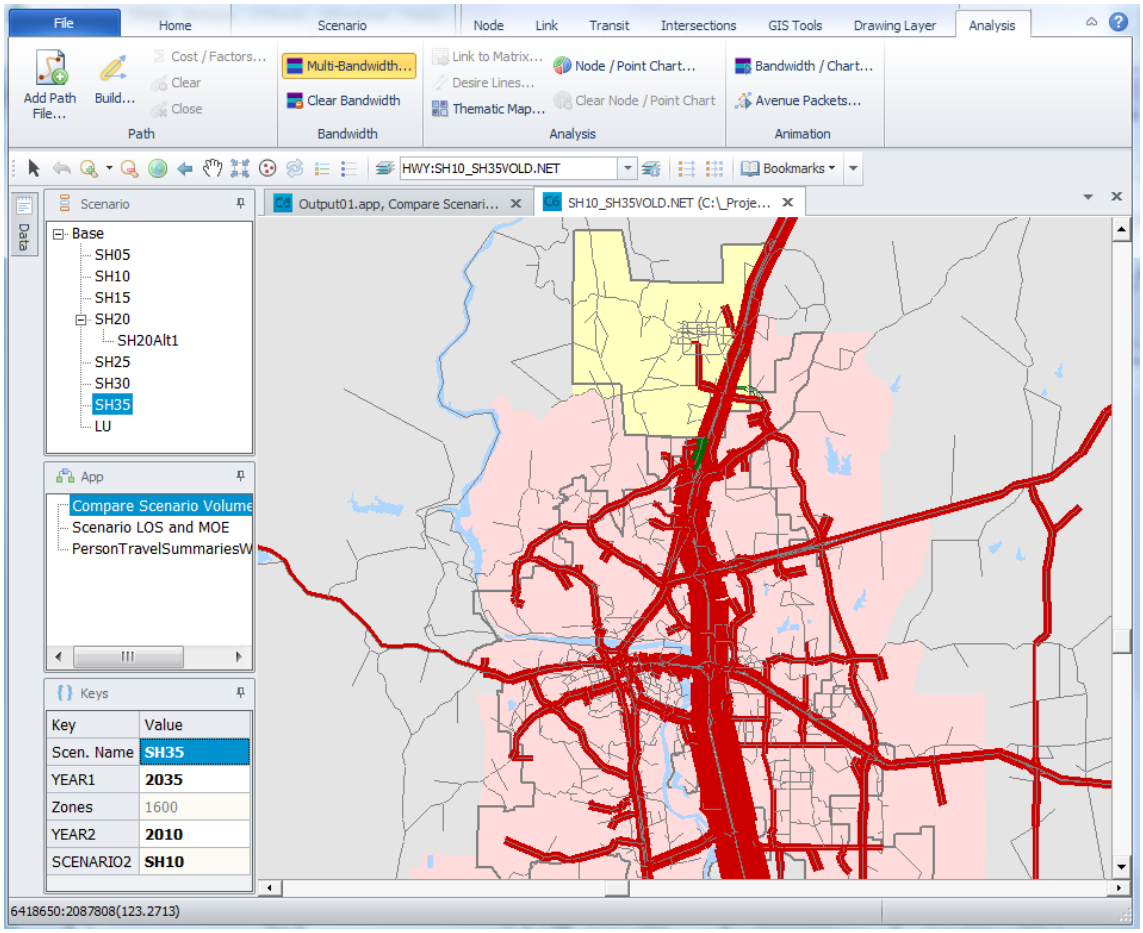
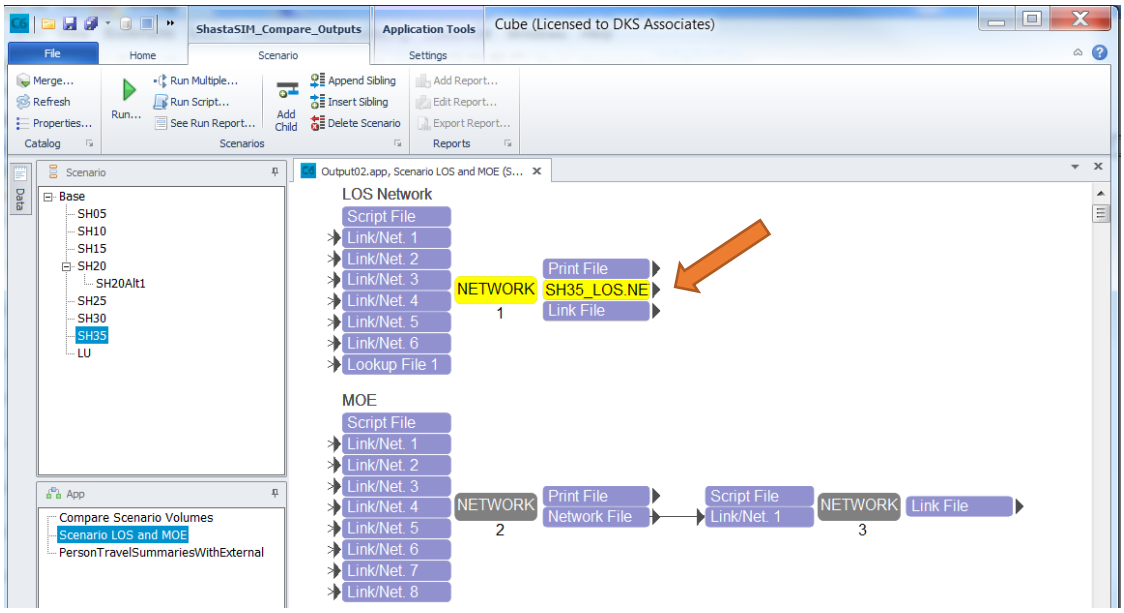
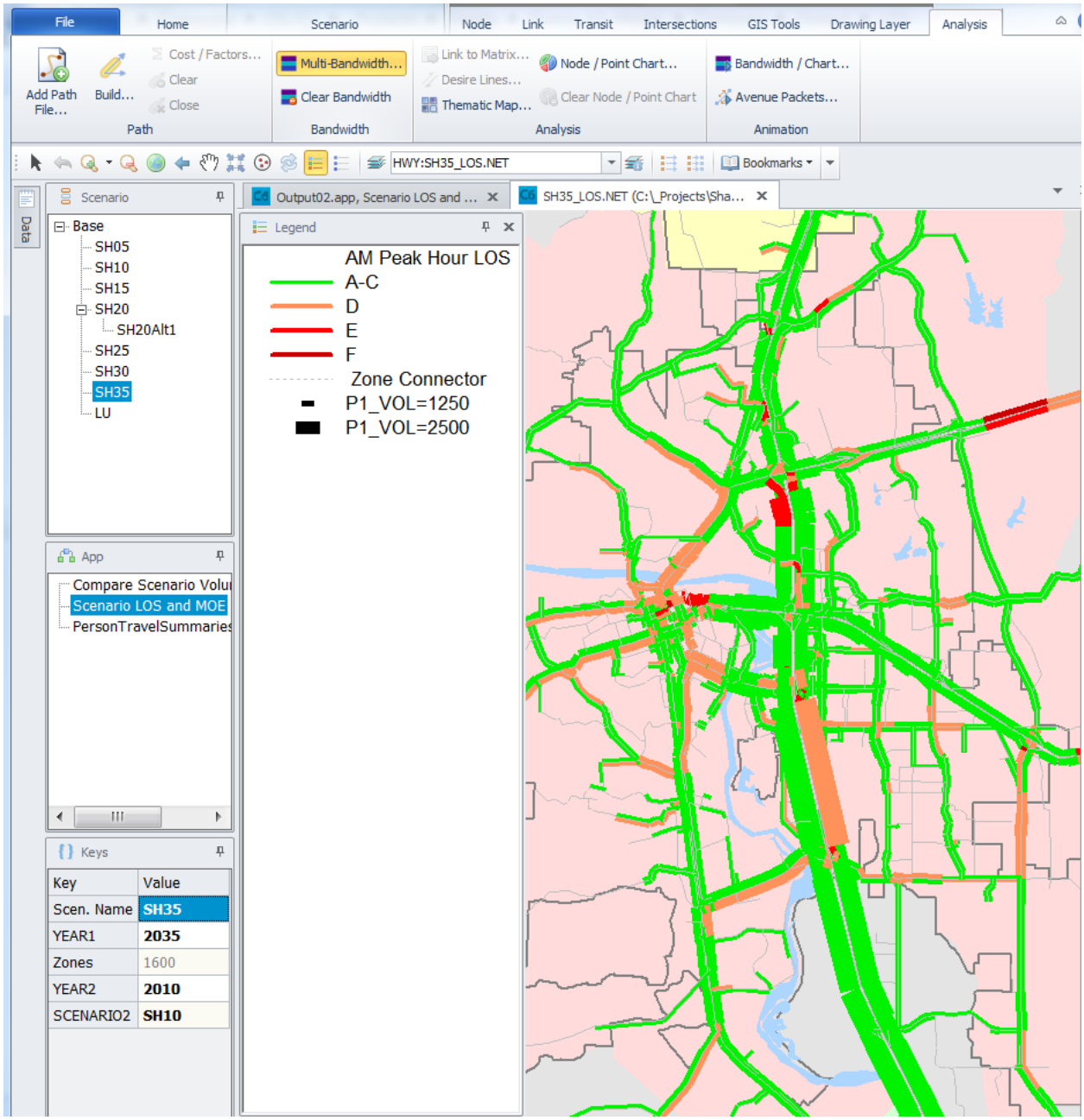


Figure 48: Scenario LOS and MOE Application



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 59) 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 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)

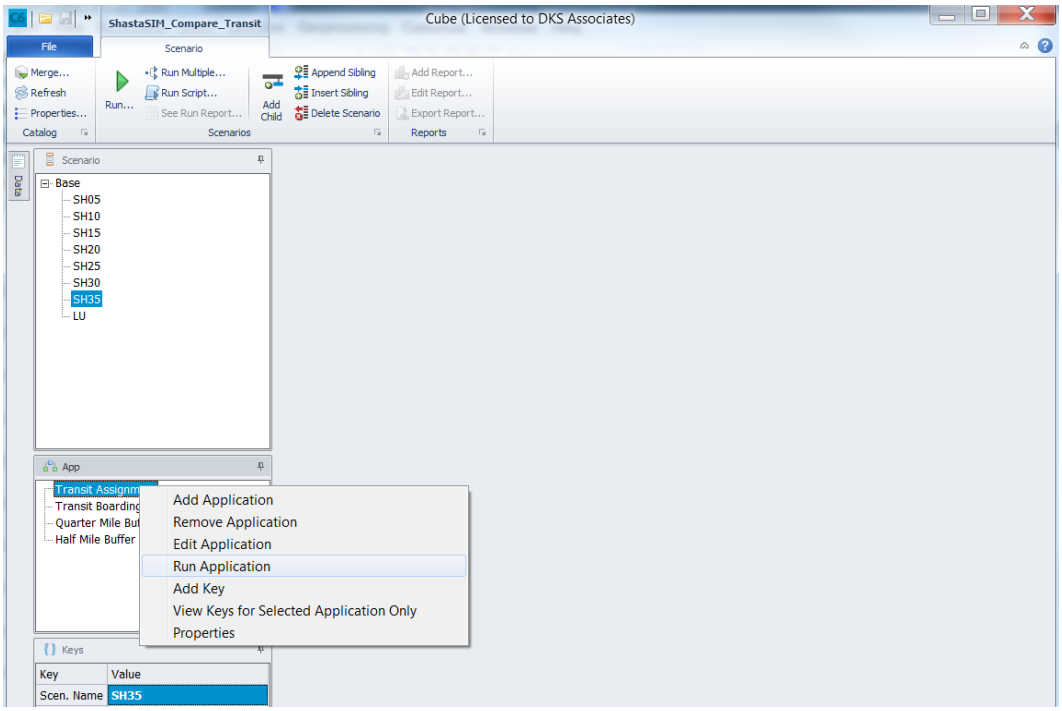
The following Keys are used in the Model Outputs application:

- {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).

Compare Transit Application

The **SHASTASIM_COMPARE_TRANSIT.CAT** can be opened in CUBE using the same methods described on **page 13**. 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.

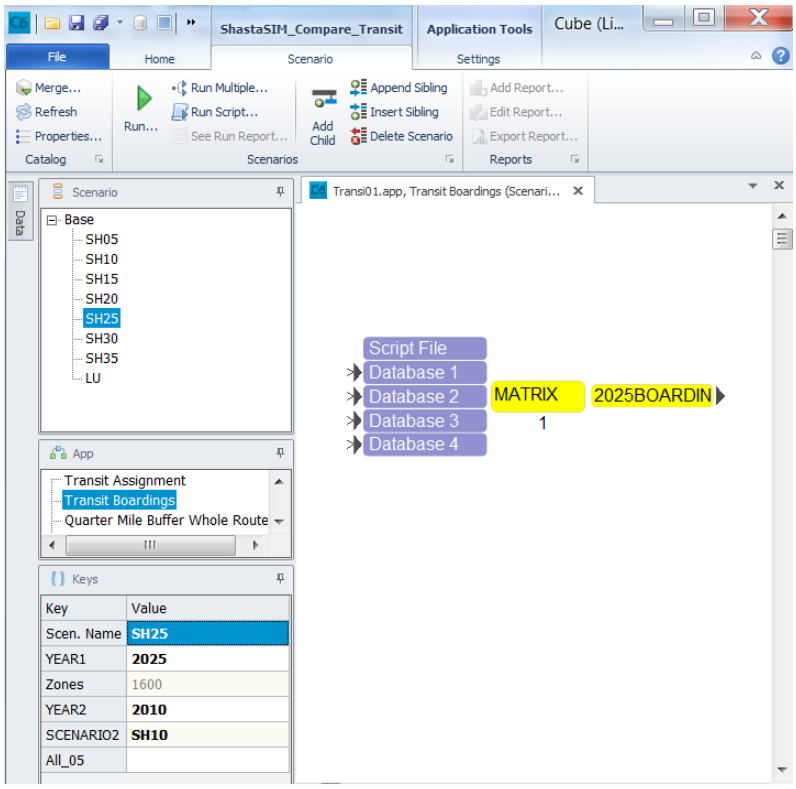
Figure 50: Compare Transit Application



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.

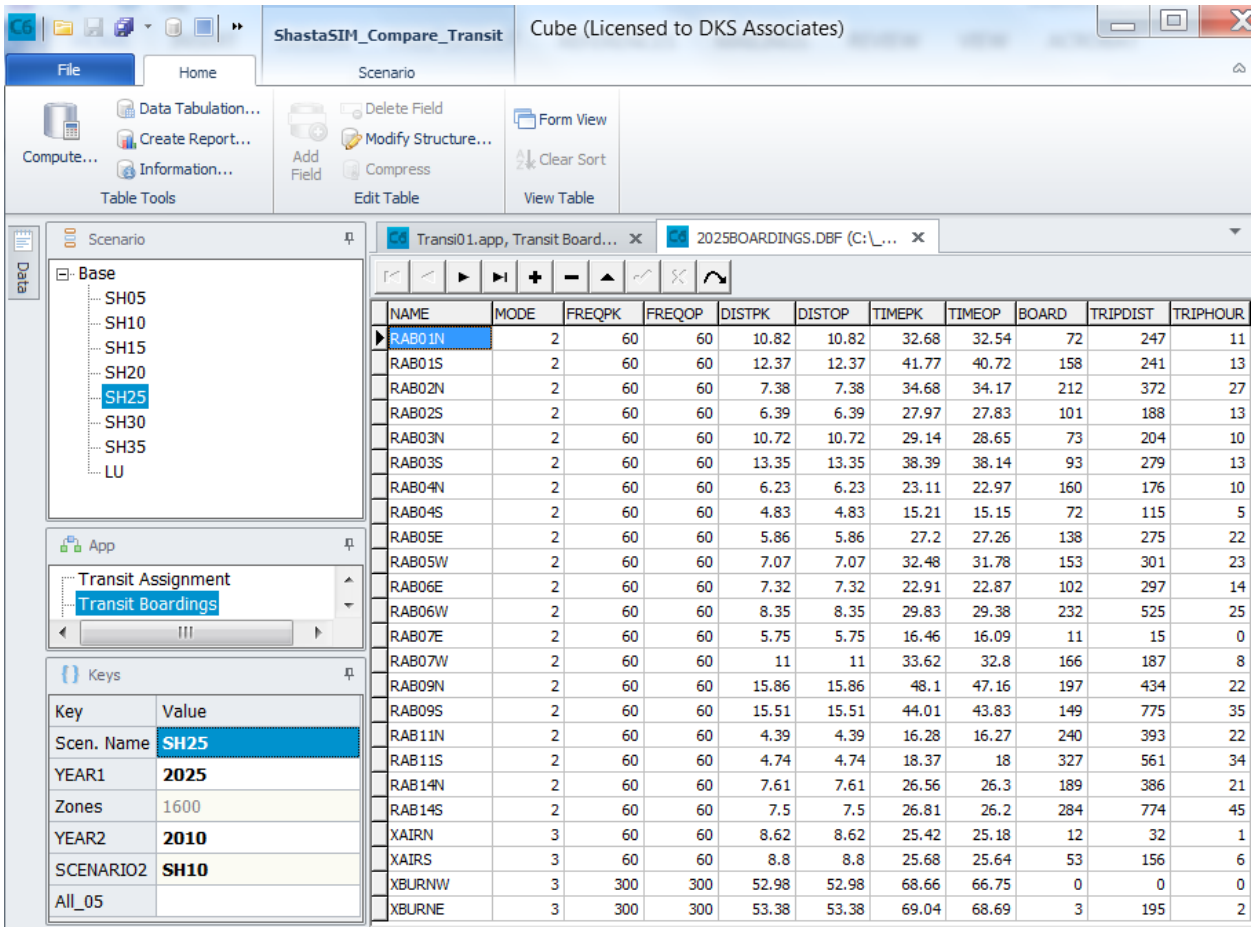
- Generalized Transit Loading Data by Route (one row per route direction)
  - **20xxLVPW.CSV** (walk-access transit loadings, peak period)
  - **20xxLVPD.CSV** (drive-access transit loadings, peak period)
  - **20xxLVOW.CSV** (walk-access transit loadings, off peak)
  - **20xxLVOD.CSV** (drive-access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

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 comparison of boardings between scenarios, individual .DBF files can be copied into sheets in a spreadsheet for review. The boardings file can be opened by double clicking on the appropriate box in the **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).

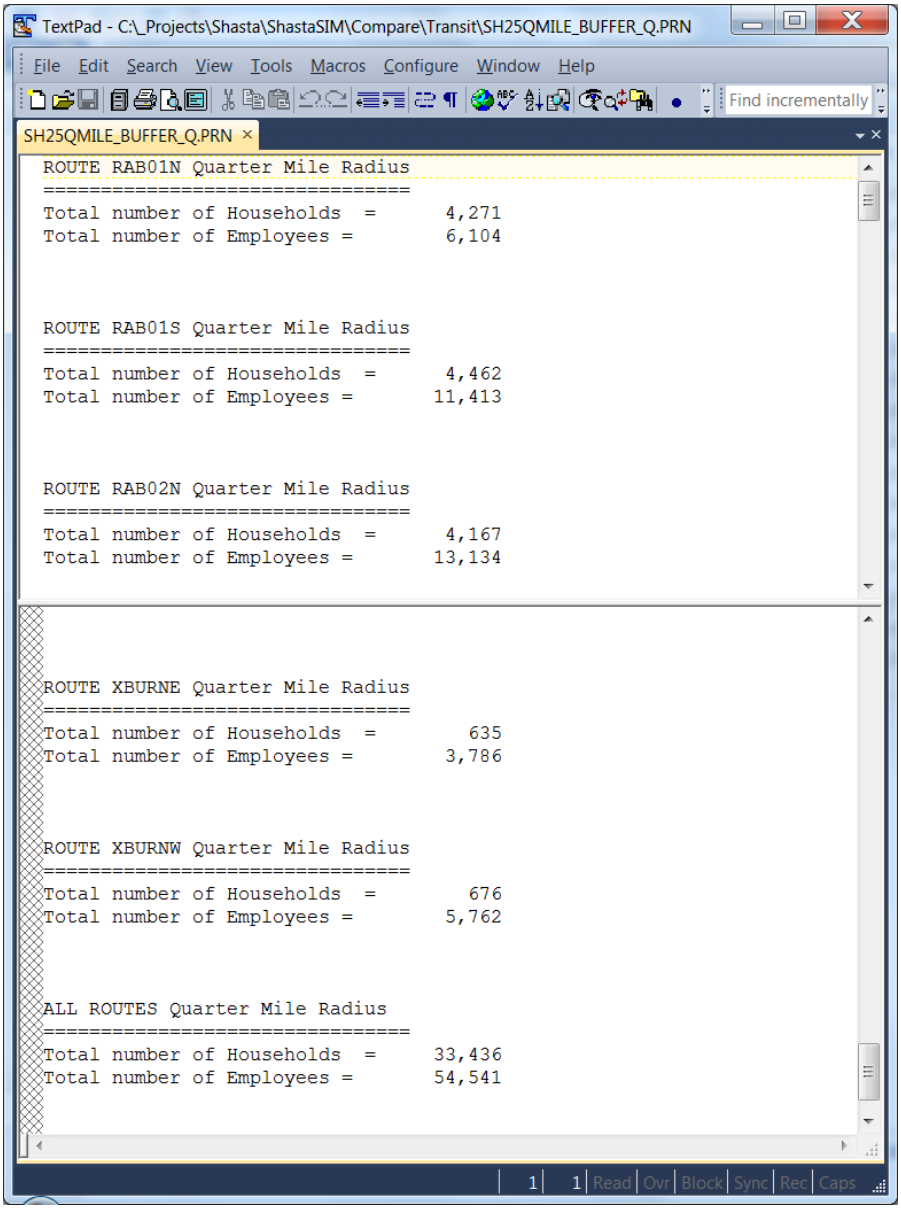
Figure 51: Compare Transit Boardings Output



NAME	MODE	FREQPK	FREQOP	DISTPK	DISTOP	TIMEPK	TIMEOP	BOARD	TRIPDIST	TRIPHOUR
RAB01N	2	60	60	10.82	10.82	32.68	32.54	72	247	11
RAB01S	2	60	60	12.37	12.37	41.77	40.72	158	241	13
RAB02N	2	60	60	7.38	7.38	34.68	34.17	212	372	27
RAB02S	2	60	60	6.39	6.39	27.97	27.83	101	188	13
RAB03N	2	60	60	10.72	10.72	29.14	28.65	73	204	10
RAB03S	2	60	60	13.35	13.35	38.39	38.14	93	279	13
RAB04N	2	60	60	6.23	6.23	23.11	22.97	160	176	10
RAB04S	2	60	60	4.83	4.83	15.21	15.15	72	115	5
RAB05E	2	60	60	5.86	5.86	27.2	27.26	138	275	22
RAB05W	2	60	60	7.07	7.07	32.48	31.78	153	301	23
RAB06E	2	60	60	7.32	7.32	22.91	22.87	102	297	14
RAB06W	2	60	60	8.35	8.35	29.83	29.38	232	525	25
RAB07E	2	60	60	5.75	5.75	16.46	16.09	11	15	0
RAB07W	2	60	60	11	11	33.62	32.8	166	187	8
RAB09N	2	60	60	15.86	15.86	48.1	47.16	197	434	22
RAB09S	2	60	60	15.51	15.51	44.01	43.83	149	775	35
RAB11N	2	60	60	4.39	4.39	16.28	16.27	240	393	22
RAB11S	2	60	60	4.74	4.74	18.37	18	327	561	34
RAB14N	2	60	60	7.61	7.61	26.56	26.3	189	386	21
RAB14S	2	60	60	7.5	7.5	26.81	26.2	284	774	45
XAIRN	3	60	60	8.62	8.62	25.42	25.18	12	32	1
XAIRS	3	60	60	8.8	8.8	25.68	25.64	53	156	6
XBURNW	3	300	300	52.98	52.98	68.66	66.75	0	0	0
XBURNE	3	300	300	53.38	53.38	69.04	68.69	3	195	2

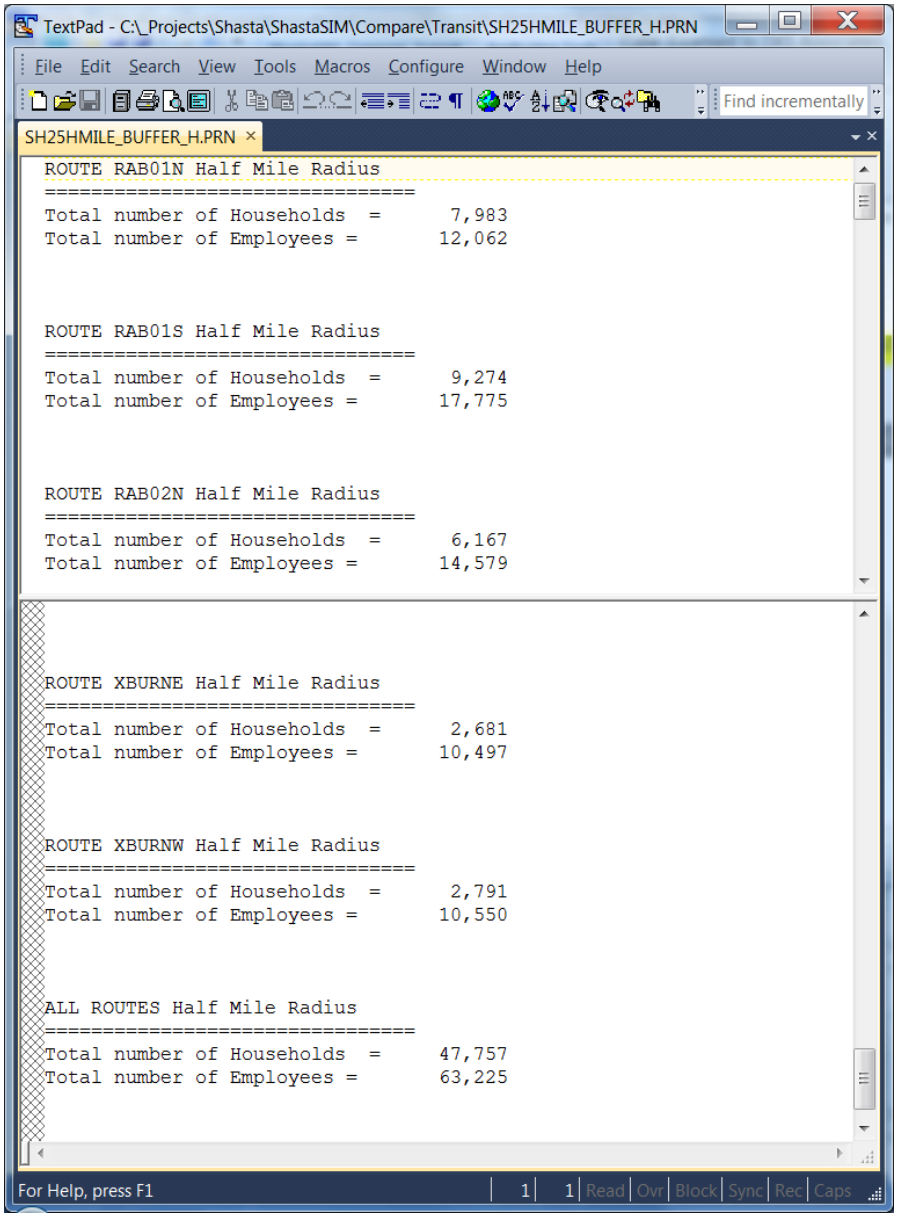
Quarter Mile Buffer Whole Route: This module calculates the number of households and employees within a ¼ mile radius of the stops of each transit route. Households and employment within ¼ mile of more than one stop are not double counted. Resultant text .PRN files are created for each transit route 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 52: Households & Employment Within ¼ Mile of Transit Stop Output



Half Mile Buffer Whole Route: 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 53: 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.

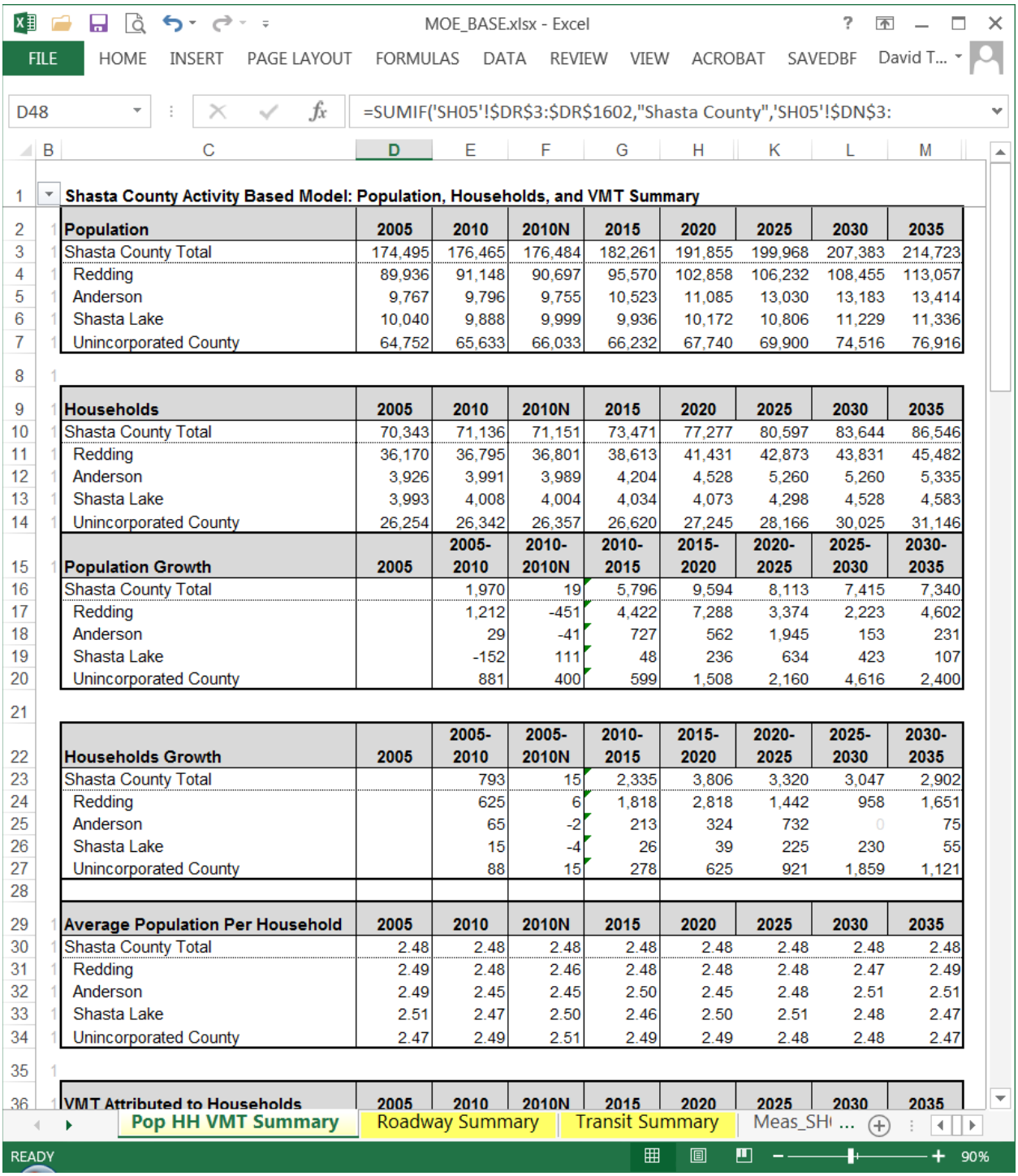
9. SUMMARIZATION OF MOE RESULTS

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, 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 54** to **Figure 60**. Each year also has a roadway system MOE sheet called MEAS_SHXX, a screenshot of which is shown in **Figure 61**.

Figure 54: MOE_BASE.XLS Population and Households Summary



MOE_BASE.xlsx - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ACROBAT SAVEDBF David T...

D48 =SUMIF('SH05'!$DR$3:$DR$1602,"Shasta County",'SH05'!$DN$3:

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

Population	2005	2010	2010N	2015	2020	2025	2030	2035
Shasta County Total	174,495	176,465	176,484	182,261	191,855	199,968	207,383	214,723
Redding	89,936	91,148	90,697	95,570	102,858	106,232	108,455	113,057
Anderson	9,767	9,796	9,755	10,523	11,085	13,030	13,183	13,414
Shasta Lake	10,040	9,888	9,999	9,936	10,172	10,806	11,229	11,336
Unincorporated County	64,752	65,633	66,033	66,232	67,740	69,900	74,516	76,916

Households	2005	2010	2010N	2015	2020	2025	2030	2035
Shasta County Total	70,343	71,136	71,151	73,471	77,277	80,597	83,644	86,546
Redding	36,170	36,795	36,801	38,613	41,431	42,873	43,831	45,482
Anderson	3,926	3,991	3,989	4,204	4,528	5,260	5,260	5,335
Shasta Lake	3,993	4,008	4,004	4,034	4,073	4,298	4,528	4,583
Unincorporated County	26,254	26,342	26,357	26,620	27,245	28,166	30,025	31,146

Population Growth	2005	2005-2010	2010-2010N	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035
Shasta County Total		1,970	19	5,796	9,594	8,113	7,415	7,340
Redding		1,212	-451	4,422	7,288	3,374	2,223	4,602
Anderson		29	-41	727	562	1,945	153	231
Shasta Lake		-152	111	48	236	634	423	107
Unincorporated County		881	400	599	1,508	2,160	4,616	2,400

Households Growth	2005	2005-2010	2005-2010N	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035
Shasta County Total		793	15	2,335	3,806	3,320	3,047	2,902
Redding		625	6	1,818	2,818	1,442	958	1,651
Anderson		65	-2	213	324	732	0	75
Shasta Lake		15	-4	26	39	225	230	55
Unincorporated County		88	15	278	625	921	1,859	1,121

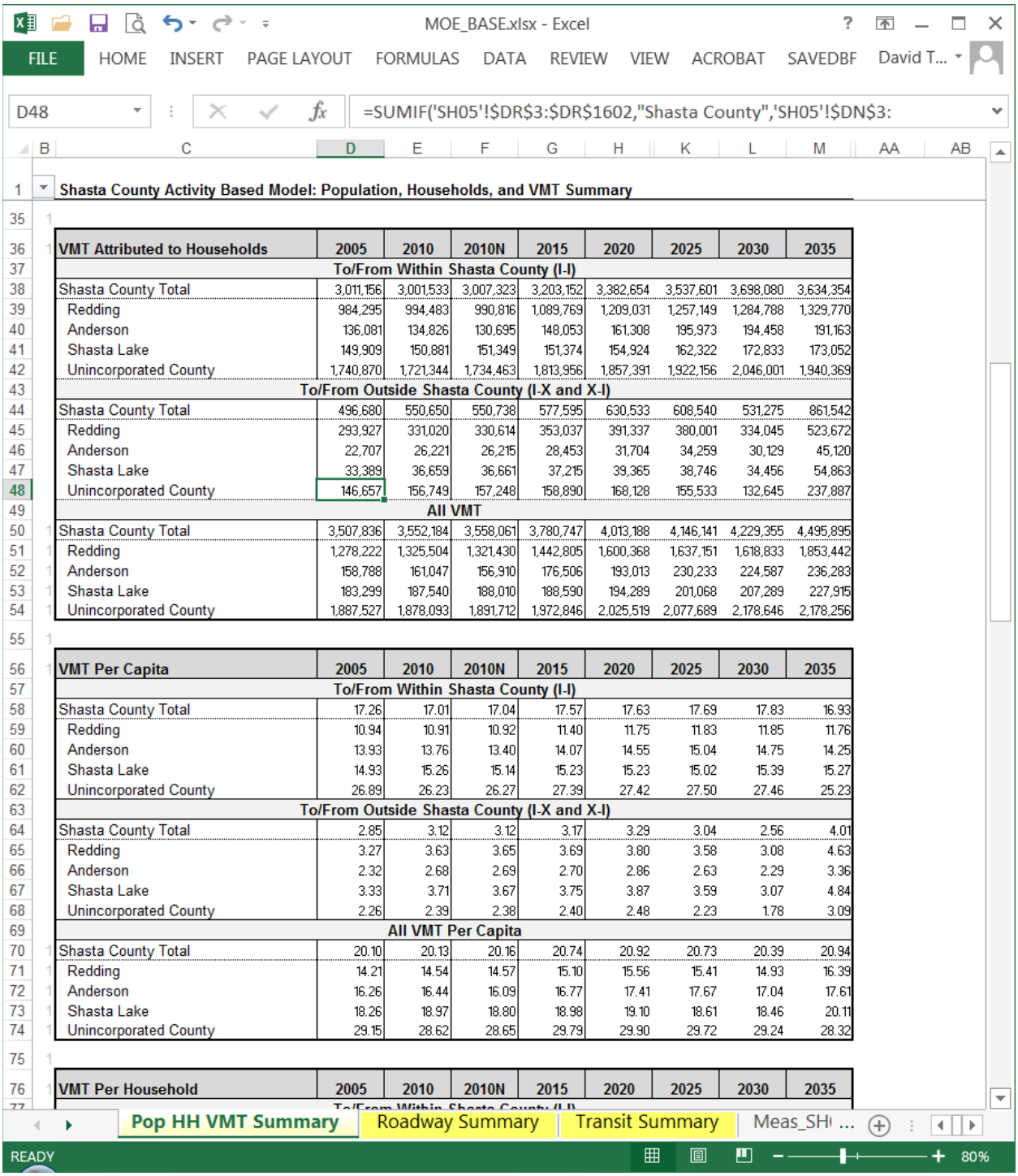
Average Population Per Household	2005	2010	2010N	2015	2020	2025	2030	2035
Shasta County Total	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
Redding	2.49	2.48	2.46	2.48	2.48	2.48	2.47	2.49
Anderson	2.49	2.45	2.45	2.50	2.45	2.48	2.51	2.51
Shasta Lake	2.51	2.47	2.50	2.46	2.50	2.51	2.48	2.47
Unincorporated County	2.47	2.49	2.51	2.49	2.49	2.48	2.48	2.47

VMT Attributed to Households	2005	2010	2010N	2015	2020	2025	2030	2035

Pop HH VMT Summary | Roadway Summary | Transit Summary | Meas_SH ...

READY 90%

Figure 55: MOE_BASE.XLS VMT Summary



MOE_BASE.xlsx - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ACROBAT SAVEDBF David T...

D48 =SUMIF('SH05'!$DR$3:$DR$1602,"Shasta County",'SH05'!$DN$3:

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

VMT Attributed to Households	2005	2010	2010N	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)								
Shasta County Total	3,011,156	3,001,533	3,007,323	3,203,152	3,382,654	3,537,601	3,698,080	3,634,354
Redding	984,295	994,483	990,816	1,089,769	1,209,031	1,257,149	1,284,788	1,329,770
Anderson	136,081	134,826	130,695	148,053	161,308	195,973	194,458	191,163
Shasta Lake	149,909	150,881	151,349	151,374	154,924	162,322	172,833	173,052
Unincorporated County	1,740,870	1,721,344	1,734,463	1,813,956	1,857,391	1,922,156	2,046,001	1,940,369
To/From Outside Shasta County (I-X and X-I)								
Shasta County Total	496,680	550,650	550,738	577,595	630,533	608,540	531,275	861,542
Redding	293,927	331,020	330,614	353,037	391,337	380,001	334,045	523,672
Anderson	22,707	26,221	26,215	28,453	31,704	34,259	30,129	45,120
Shasta Lake	33,389	36,659	36,661	37,215	39,365	38,746	34,456	54,863
Unincorporated County	146,657	156,749	157,248	158,890	168,128	155,533	132,645	237,887
All VMT								
Shasta County Total	3,507,836	3,552,184	3,558,061	3,780,747	4,013,188	4,146,141	4,229,355	4,495,895
Redding	1,278,222	1,325,504	1,321,430	1,442,805	1,600,368	1,637,151	1,618,833	1,853,442
Anderson	158,788	161,047	156,910	176,506	193,013	230,233	224,587	236,283
Shasta Lake	183,299	187,540	188,010	188,590	194,289	201,068	207,289	227,915
Unincorporated County	1,887,527	1,878,093	1,891,712	1,972,846	2,025,519	2,077,689	2,178,646	2,178,256

VMT Per Capita	2005	2010	2010N	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)								
Shasta County Total	17.26	17.01	17.04	17.57	17.63	17.69	17.83	16.93
Redding	10.94	10.91	10.92	11.40	11.75	11.83	11.85	11.76
Anderson	13.93	13.76	13.40	14.07	14.55	15.04	14.75	14.25
Shasta Lake	14.93	15.26	15.14	15.23	15.23	15.02	15.39	15.27
Unincorporated County	26.89	26.23	26.27	27.39	27.42	27.50	27.46	25.23
To/From Outside Shasta County (I-X and X-I)								
Shasta County Total	2.85	3.12	3.12	3.17	3.29	3.04	2.56	4.01
Redding	3.27	3.63	3.65	3.69	3.80	3.58	3.08	4.63
Anderson	2.32	2.68	2.69	2.70	2.86	2.63	2.29	3.36
Shasta Lake	3.33	3.71	3.67	3.75	3.87	3.59	3.07	4.84
Unincorporated County	2.26	2.39	2.38	2.40	2.48	2.23	1.78	3.09
All VMT Per Capita								
Shasta County Total	20.10	20.13	20.16	20.74	20.92	20.73	20.39	20.94
Redding	14.21	14.54	14.57	15.10	15.56	15.41	14.93	16.39
Anderson	16.26	16.44	16.09	16.77	17.41	17.67	17.04	17.61
Shasta Lake	18.26	18.97	18.80	18.98	19.10	18.61	18.46	20.11
Unincorporated County	29.15	28.62	28.65	29.79	29.90	29.72	29.24	28.32

VMT Per Household	2005	2010	2010N	2015	2020	2025	2030	2035

Pop HH VMT Summary | Roadway Summary | Transit Summary | Meas_SH ...

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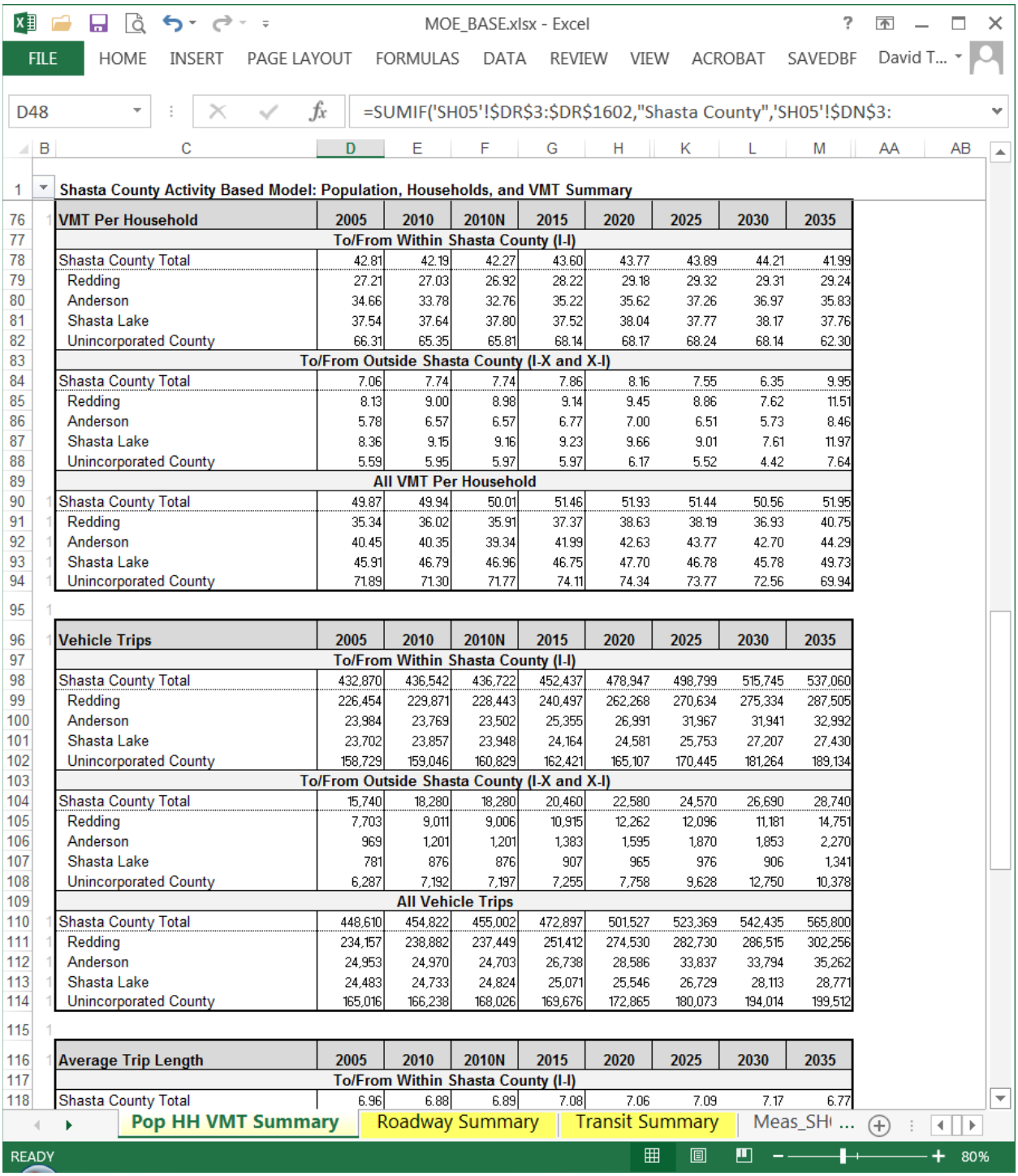
Figure 56: MOE_BASE.XLS VMT and Trips Summary



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D48 =SUMIF('SH05'!$DR$3:$DR$1602,"Shasta County",'SH05'!$DN$3:

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

VMT Per Household	2005	2010	2010N	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)								
Shasta County Total	42.81	42.19	42.27	43.60	43.77	43.89	44.21	41.99
Redding	27.21	27.03	26.92	28.22	29.18	29.32	29.31	29.24
Anderson	34.66	33.78	32.76	35.22	35.62	37.26	36.97	35.83
Shasta Lake	37.54	37.64	37.80	37.52	38.04	37.77	38.17	37.76
Unincorporated County	66.31	65.35	65.81	68.14	68.17	68.24	68.14	62.30
To/From Outside Shasta County (I-X and X-I)								
Shasta County Total	7.06	7.74	7.74	7.86	8.16	7.55	6.35	9.95
Redding	8.13	9.00	8.98	9.14	9.45	8.86	7.62	11.51
Anderson	5.78	6.57	6.57	6.77	7.00	6.51	5.73	8.46
Shasta Lake	8.36	9.15	9.16	9.23	9.66	9.01	7.61	11.97
Unincorporated County	5.59	5.95	5.97	5.97	6.17	5.52	4.42	7.64
All VMT Per Household								
Shasta County Total	49.87	49.94	50.01	51.46	51.93	51.44	50.56	51.95
Redding	35.34	36.02	35.91	37.37	38.63	38.19	36.93	40.75
Anderson	40.45	40.35	39.34	41.99	42.63	43.77	42.70	44.29
Shasta Lake	45.91	46.79	46.96	46.75	47.70	46.78	45.78	49.73
Unincorporated County	71.89	71.30	71.77	74.11	74.34	73.77	72.56	69.94

Vehicle Trips	2005	2010	2010N	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)								
Shasta County Total	432,870	436,542	436,722	452,437	478,947	498,799	515,745	537,060
Redding	226,454	229,871	228,443	240,497	262,268	270,634	275,334	287,505
Anderson	23,984	23,769	23,502	25,355	26,991	31,967	31,941	32,992
Shasta Lake	23,702	23,857	23,948	24,164	24,581	25,753	27,207	27,430
Unincorporated County	158,729	159,046	160,829	162,421	165,107	170,445	181,264	189,134
To/From Outside Shasta County (I-X and X-I)								
Shasta County Total	15,740	18,280	18,280	20,460	22,580	24,570	26,690	28,740
Redding	7,703	9,011	9,006	10,915	12,262	12,096	11,181	14,751
Anderson	969	1,201	1,201	1,383	1,595	1,870	1,853	2,270
Shasta Lake	781	876	876	907	965	976	906	1,341
Unincorporated County	6,287	7,192	7,197	7,255	7,758	9,628	12,750	10,378
All Vehicle Trips								
Shasta County Total	448,610	454,822	455,002	472,897	501,527	523,369	542,435	565,800
Redding	234,157	238,882	237,449	251,412	274,530	282,730	286,515	302,256
Anderson	24,953	24,970	24,703	26,738	28,586	33,837	33,794	35,262
Shasta Lake	24,483	24,733	24,824	25,071	25,546	26,729	28,113	28,771
Unincorporated County	165,016	166,238	168,026	169,676	172,865	180,073	194,014	199,512

Average Trip Length	2005	2010	2010N	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)								
Shasta County Total	6.96	6.88	6.89	7.08	7.06	7.09	7.17	6.77

Pop HH VMT Summary | Roadway Summary | Transit Summary | Meas_SH ...

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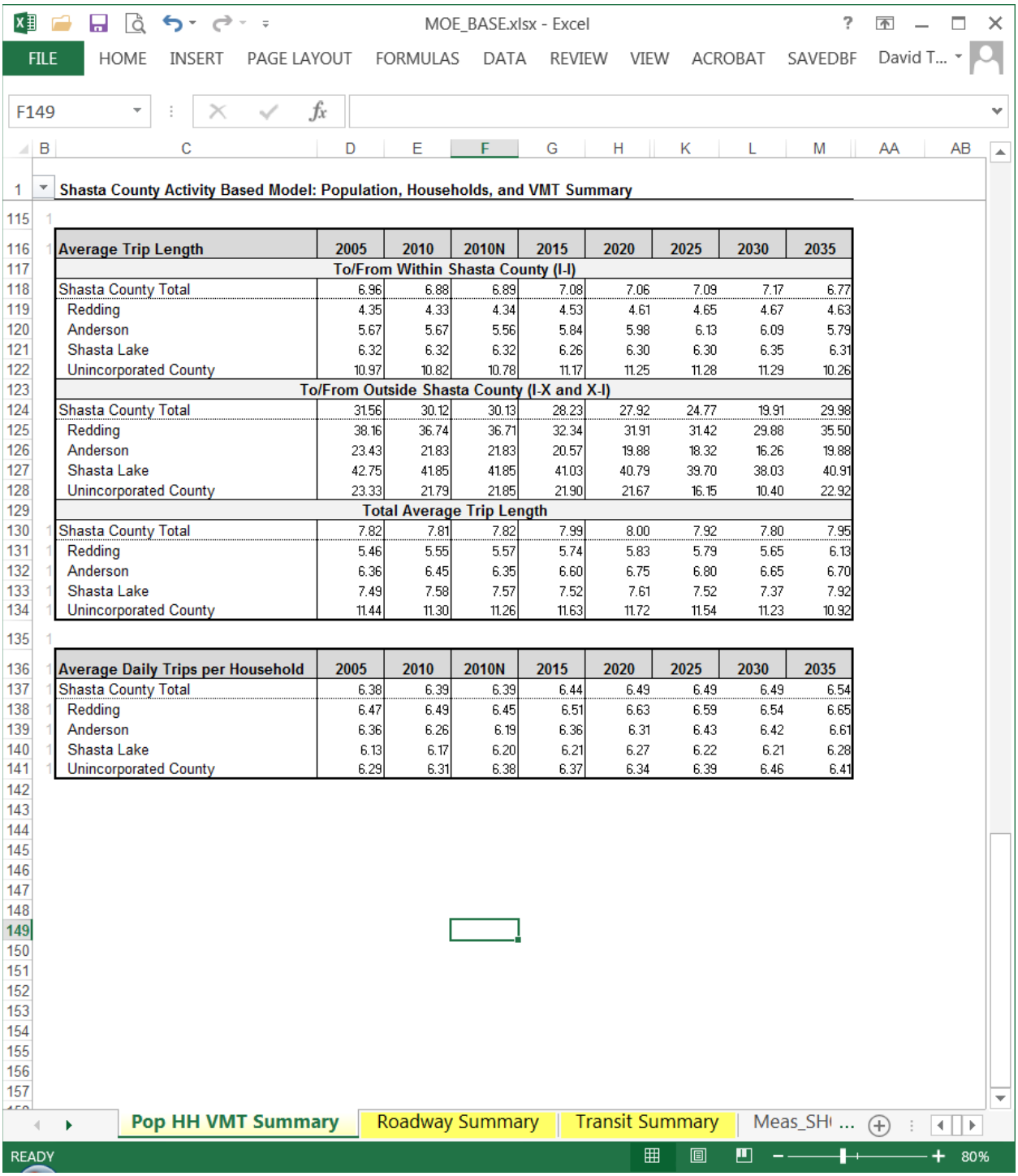
Figure 57: MOE_BASE.XLS Trips Summary

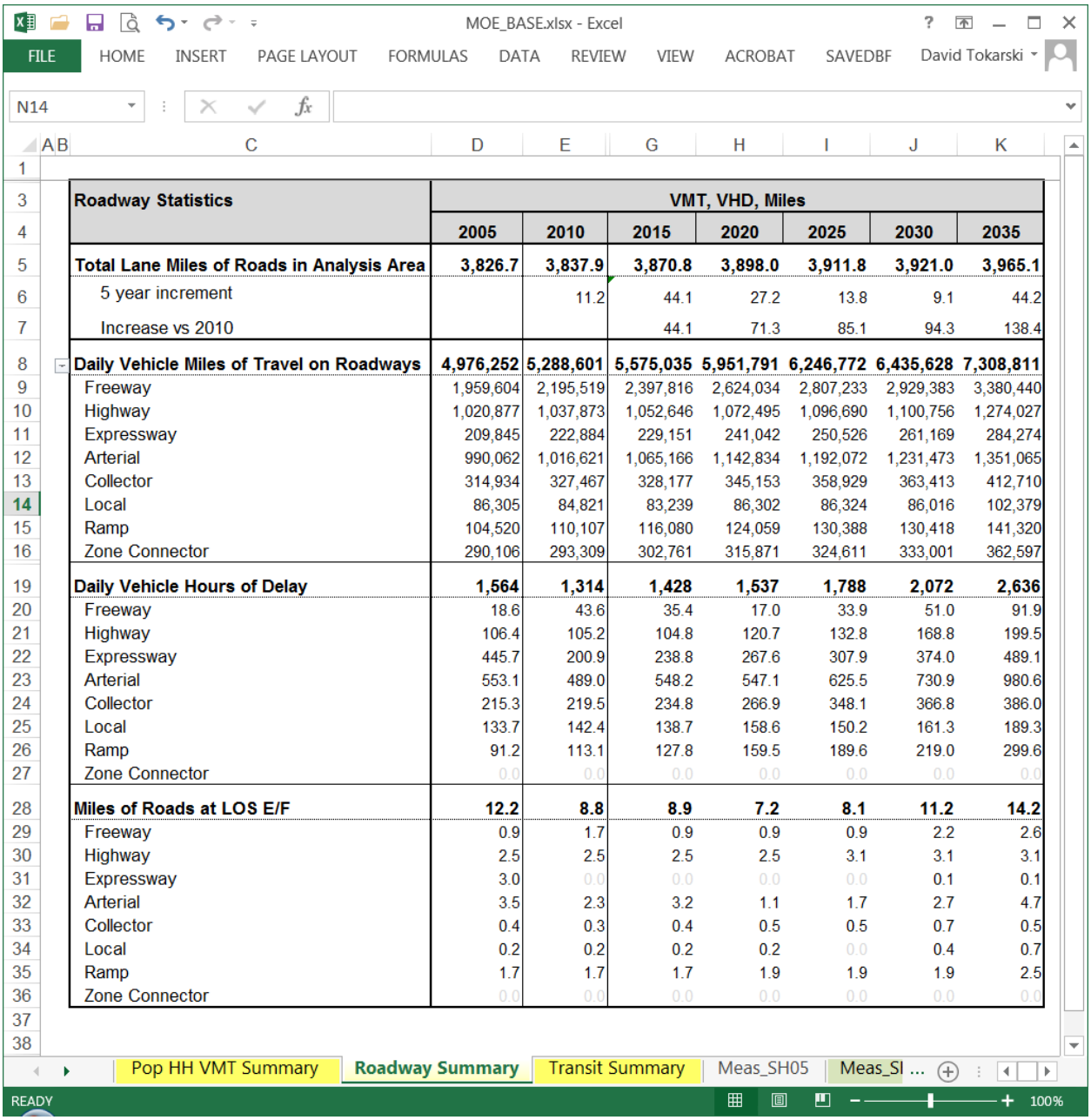


Shasta County Activity Based Model: Population, Households, and VMT Summary

Average Trip Length	2005	2010	2010N	2015	2020	2025	2030	2035
To/From Within Shasta County (I-I)								
Shasta County Total	6.96	6.88	6.89	7.08	7.06	7.09	7.17	6.77
Redding	4.35	4.33	4.34	4.53	4.61	4.65	4.67	4.63
Anderson	5.67	5.67	5.56	5.84	5.98	6.13	6.09	5.79
Shasta Lake	6.32	6.32	6.32	6.26	6.30	6.30	6.35	6.31
Unincorporated County	10.97	10.82	10.78	11.17	11.25	11.28	11.29	10.26
To/From Outside Shasta County (I-X and X-I)								
Shasta County Total	31.56	30.12	30.13	28.23	27.92	24.77	19.91	29.98
Redding	38.16	36.74	36.71	32.34	31.91	31.42	29.88	35.50
Anderson	23.43	21.83	21.83	20.57	19.88	18.32	16.26	19.88
Shasta Lake	42.75	41.85	41.85	41.03	40.79	39.70	38.03	40.91
Unincorporated County	23.33	21.79	21.85	21.90	21.67	16.15	10.40	22.92
Total Average Trip Length								
Shasta County Total	7.82	7.81	7.82	7.99	8.00	7.92	7.80	7.95
Redding	5.46	5.55	5.57	5.74	5.83	5.79	5.65	6.13
Anderson	6.36	6.45	6.35	6.60	6.75	6.80	6.65	6.70
Shasta Lake	7.49	7.58	7.57	7.52	7.61	7.52	7.37	7.92
Unincorporated County	11.44	11.30	11.26	11.63	11.72	11.54	11.23	10.92

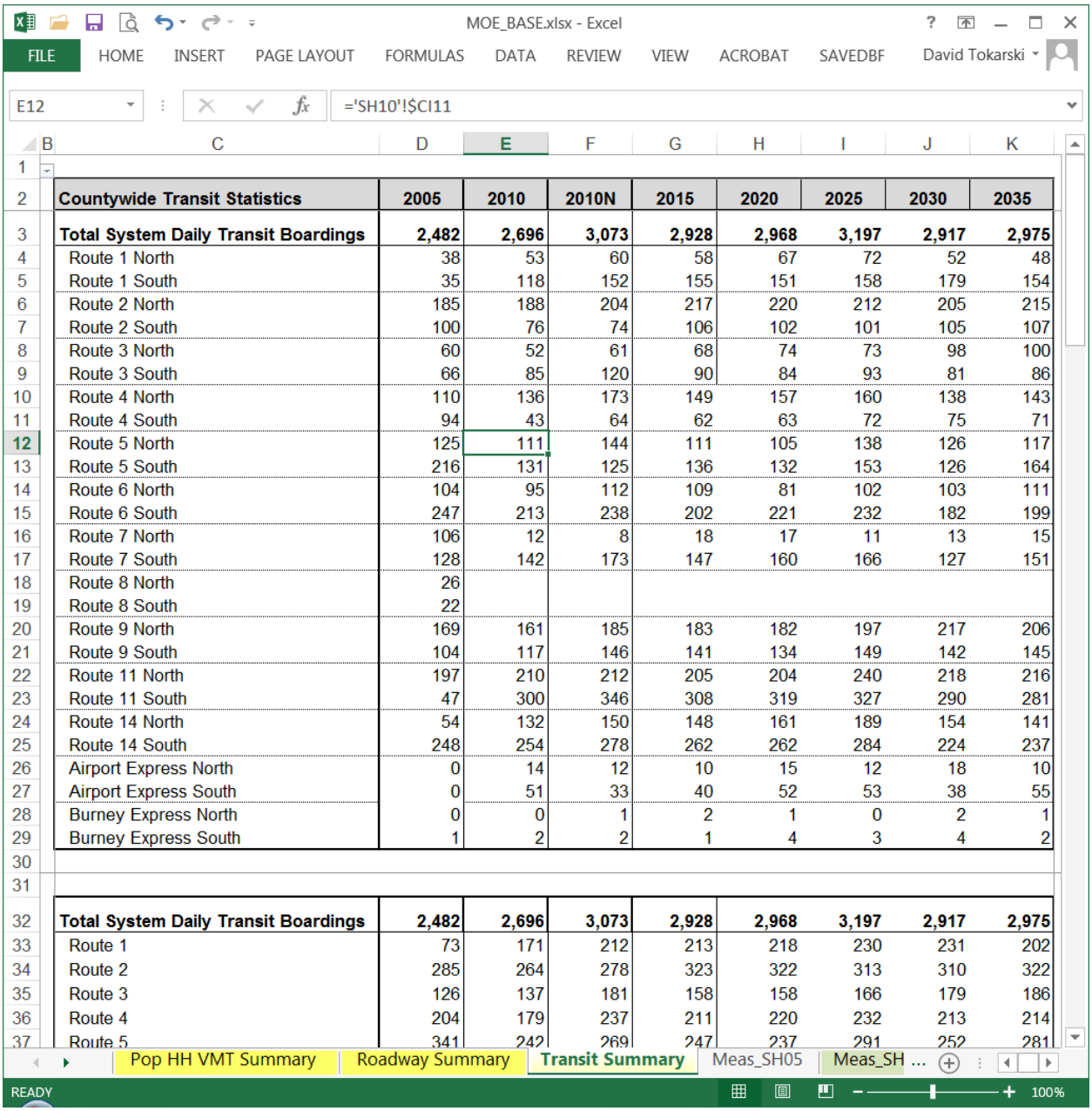
Average Daily Trips per Household	2005	2010	2010N	2015	2020	2025	2030	2035
Shasta County Total	6.38	6.39	6.39	6.44	6.49	6.49	6.49	6.54
Redding	6.47	6.49	6.45	6.51	6.63	6.59	6.54	6.65
Anderson	6.36	6.26	6.19	6.36	6.31	6.43	6.42	6.61
Shasta Lake	6.13	6.17	6.20	6.21	6.27	6.22	6.21	6.28
Unincorporated County	6.29	6.31	6.38	6.37	6.34	6.39	6.46	6.41

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**	**3,837.9**	**3,870.8**	**3,898.0**	**3,911.8**	**3,921.0**	**3,965.1**
5 year increment		11.2	44.1	27.2	13.8	9.1	44.2
Increase vs 2010			44.1	71.3	85.1	94.3	138.4
Daily Vehicle Miles of Travel on Roadways	**4,976,252**	**5,288,601**	**5,575,035**	**5,951,791**	**6,246,772**	**6,435,628**	**7,308,811**
Freeway	1,959,604	2,195,519	2,397,816	2,624,034	2,807,233	2,929,383	3,380,440
Highway	1,020,877	1,037,873	1,052,646	1,072,495	1,096,690	1,100,756	1,274,027
Expressway	209,845	222,884	229,151	241,042	250,526	261,169	284,274
Arterial	990,062	1,016,621	1,065,166	1,142,834	1,192,072	1,231,473	1,351,065
Collector	314,934	327,467	328,177	345,153	358,929	363,413	412,710
Local	86,305	84,821	83,239	86,302	86,324	86,016	102,379
Ramp	104,520	110,107	116,080	124,059	130,388	130,418	141,320
Zone Connector	290,106	293,309	302,761	315,871	324,611	333,001	362,597
Daily Vehicle Hours of Delay	**1,564**	**1,314**	**1,428**	**1,537**	**1,788**	**2,072**	**2,636**
Freeway	18.6	43.6	35.4	17.0	33.9	51.0	91.9
Highway	106.4	105.2	104.8	120.7	132.8	168.8	199.5
Expressway	445.7	200.9	238.8	267.6	307.9	374.0	489.1
Arterial	553.1	489.0	548.2	547.1	625.5	730.9	980.6
Collector	215.3	219.5	234.8	266.9	348.1	366.8	386.0
Local	133.7	142.4	138.7	158.6	150.2	161.3	189.3
Ramp	91.2	113.1	127.8	159.5	189.6	219.0	299.6
Zone Connector	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miles of Roads at LOS E/F	**12.2**	**8.8**	**8.9**	**7.2**	**8.1**	**11.2**	**14.2**
Freeway	0.9	1.7	0.9	0.9	0.9	2.2	2.6
Highway	2.5	2.5	2.5	2.5	3.1	3.1	3.1
Expressway	3.0	0.0	0.0	0.0	0.0	0.1	0.1
Arterial	3.5	2.3	3.2	1.1	1.7	2.7	4.7
Collector	0.4	0.3	0.4	0.5	0.5	0.7	0.5
Local	0.2	0.2	0.2	0.2	0.0	0.4	0.7
Ramp	1.7	1.7	1.7	1.9	1.9	1.9	2.5
Zone Connector	0.0	0.0	0.0	0.0	0.0	0.0	0.0

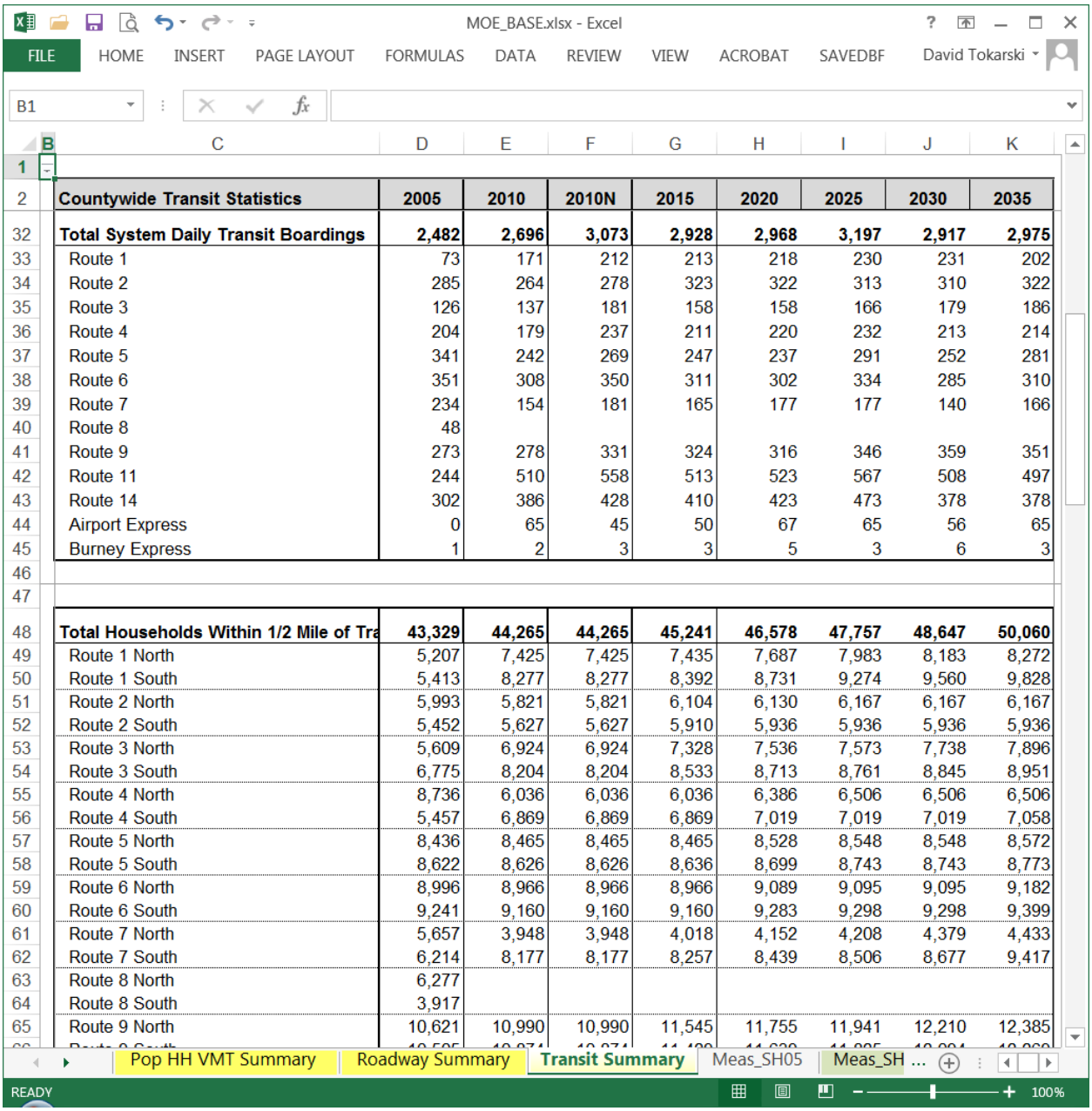
Figure 59: MOE_BASE.XLS Transit Boardings Summary



Countywide Transit Statistics	2005	2010	2010N	2015	2020	2025	2030	2035
Total System Daily Transit Boardings	**2,482**	**2,696**	**3,073**	**2,928**	**2,968**	**3,197**	**2,917**	**2,975**
Route 1 North	38	53	60	58	67	72	52	48
Route 1 South	35	118	152	155	151	158	179	154
Route 2 North	185	188	204	217	220	212	205	215
Route 2 South	100	76	74	106	102	101	105	107
Route 3 North	60	52	61	68	74	73	98	100
Route 3 South	66	85	120	90	84	93	81	86
Route 4 North	110	136	173	149	157	160	138	143
Route 4 South	94	43	64	62	63	72	75	71
Route 5 North	125	111	144	111	105	138	126	117
Route 5 South	216	131	125	136	132	153	126	164
Route 6 North	104	95	112	109	81	102	103	111
Route 6 South	247	213	238	202	221	232	182	199
Route 7 North	106	12	8	18	17	11	13	15
Route 7 South	128	142	173	147	160	166	127	151
Route 8 North	26							
Route 8 South	22							
Route 9 North	169	161	185	183	182	197	217	206
Route 9 South	104	117	146	141	134	149	142	145
Route 11 North	197	210	212	205	204	240	218	216
Route 11 South	47	300	346	308	319	327	290	281
Route 14 North	54	132	150	148	161	189	154	141
Route 14 South	248	254	278	262	262	284	224	237
Airport Express North	0	14	12	10	15	12	18	10
Airport Express South	0	51	33	40	52	53	38	55
Burney Express North	0	0	1	2	1	0	2	1
Burney Express South	1	2	2	1	4	3	4	2

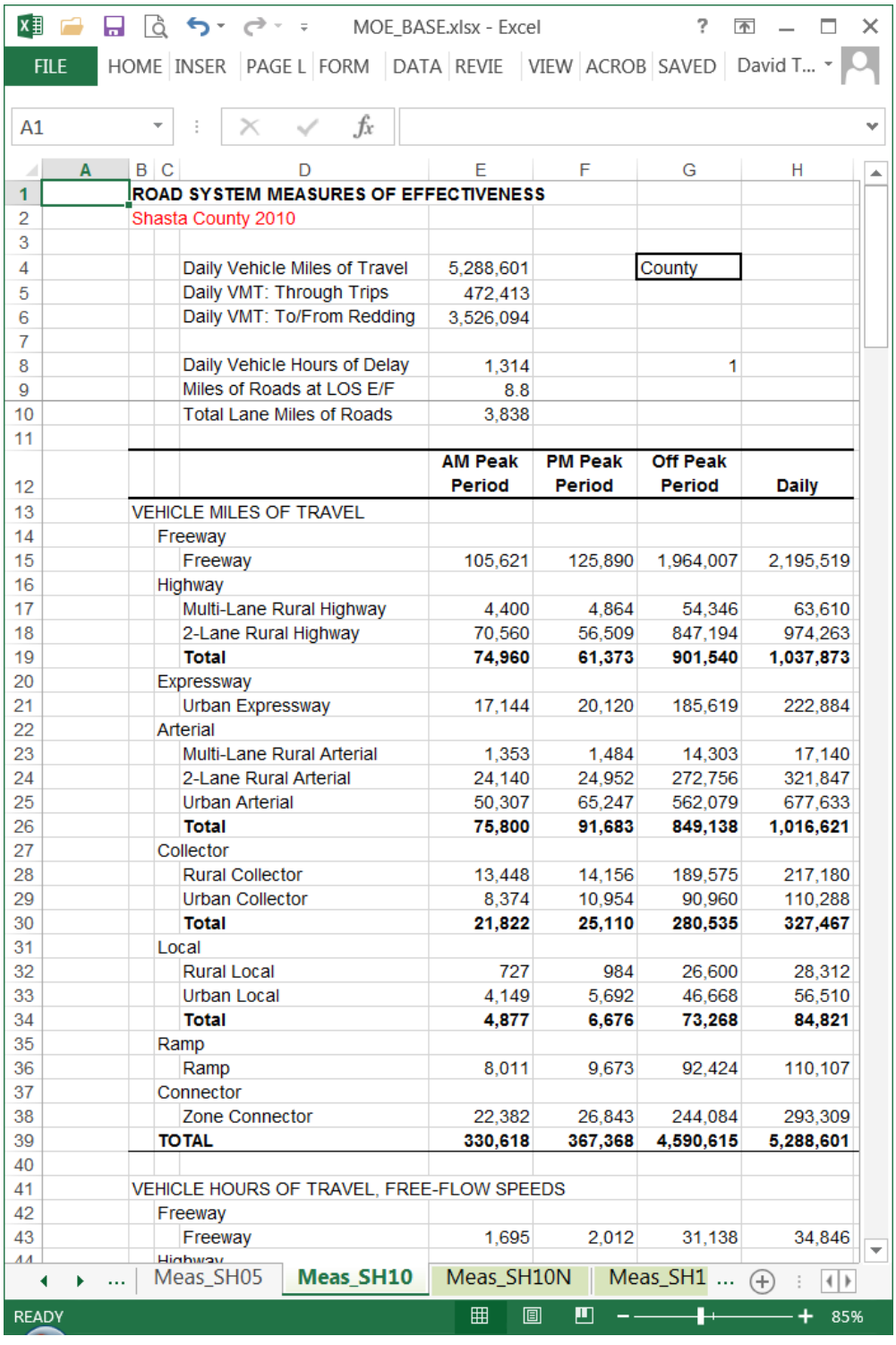
Total System Daily Transit Boardings	2,482	2,696	3,073	2,928	2,968	3,197	2,917	2,975
Route 1	73	171	212	213	218	230	231	202
Route 2	285	264	278	323	322	313	310	322
Route 3	126	137	181	158	158	166	179	186
Route 4	204	179	237	211	220	232	213	214
Route 5	341	242	269	247	237	291	252	281

Figure 60: MOE_BASE.XLS Transit Boardings Summary



Countywide Transit Statistics	2005	2010	2010N	2015	2020	2025	2030	2035
Total System Daily Transit Boardings	**2,482**	**2,696**	**3,073**	**2,928**	**2,968**	**3,197**	**2,917**	**2,975**
Route 1	73	171	212	213	218	230	231	202
Route 2	285	264	278	323	322	313	310	322
Route 3	126	137	181	158	158	166	179	186
Route 4	204	179	237	211	220	232	213	214
Route 5	341	242	269	247	237	291	252	281
Route 6	351	308	350	311	302	334	285	310
Route 7	234	154	181	165	177	177	140	166
Route 8	48							
Route 9	273	278	331	324	316	346	359	351
Route 11	244	510	558	513	523	567	508	497
Route 14	302	386	428	410	423	473	378	378
Airport Express	0	65	45	50	67	65	56	65
Burney Express	1	2	3	3	5	3	6	3
Total Households Within 1/2 Mile of Tra	**43,329**	**44,265**	**44,265**	**45,241**	**46,578**	**47,757**	**48,647**	**50,060**
Route 1 North	5,207	7,425	7,425	7,435	7,687	7,983	8,183	8,272
Route 1 South	5,413	8,277	8,277	8,392	8,731	9,274	9,560	9,828
Route 2 North	5,993	5,821	5,821	6,104	6,130	6,167	6,167	6,167
Route 2 South	5,452	5,627	5,627	5,910	5,936	5,936	5,936	5,936
Route 3 North	5,609	6,924	6,924	7,328	7,536	7,573	7,738	7,896
Route 3 South	6,775	8,204	8,204	8,533	8,713	8,761	8,845	8,951
Route 4 North	8,736	6,036	6,036	6,036	6,386	6,506	6,506	6,506
Route 4 South	5,457	6,869	6,869	6,869	7,019	7,019	7,019	7,058
Route 5 North	8,436	8,465	8,465	8,465	8,528	8,548	8,548	8,572
Route 5 South	8,622	8,626	8,626	8,636	8,699	8,743	8,743	8,773
Route 6 North	8,996	8,966	8,966	8,966	9,089	9,095	9,095	9,182
Route 6 South	9,241	9,160	9,160	9,160	9,283	9,298	9,298	9,399
Route 7 North	5,657	3,948	3,948	4,018	4,152	4,208	4,379	4,433
Route 7 South	6,214	8,177	8,177	8,257	8,439	8,506	8,677	9,417
Route 8 North	6,277							
Route 8 South	3,917							
Route 9 North	10,621	10,990	10,990	11,545	11,755	11,941	12,210	12,385

Figure 61: MOE_BASE.XLS Roadway Measures Sheet



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1	**ROAD SYSTEM MEASURES OF EFFECTIVENESS**					
2	Shasta County 2010					
3						
4	Daily Vehicle Miles of Travel	5,288,601		County		
5	Daily VMT: Through Trips	472,413				
6	Daily VMT: To/From Redding	3,526,094				
7						
8	Daily Vehicle Hours of Delay	1,314		1		
9	Miles of Roads at LOS E/F	8.8				
10	Total Lane Miles of Roads	3,838				
11						
12		**AM Peak Period**	**PM Peak Period**	**Off Peak Period**	**Daily**	
13	VEHICLE MILES OF TRAVEL					
14	Freeway					
15	Freeway	105,621	125,890	1,964,007	2,195,519	
16	Highway					
17	Multi-Lane Rural Highway	4,400	4,864	54,346	63,610	
18	2-Lane Rural Highway	70,560	56,509	847,194	974,263	
19	**Total**	**74,960**	**61,373**	**901,540**	**1,037,873**	
20	Expressway					
21	Urban Expressway	17,144	20,120	185,619	222,884	
22	Arterial					
23	Multi-Lane Rural Arterial	1,353	1,484	14,303	17,140	
24	2-Lane Rural Arterial	24,140	24,952	272,756	321,847	
25	Urban Arterial	50,307	65,247	562,079	677,633	
26	**Total**	**75,800**	**91,683**	**849,138**	**1,016,621**	
27	Collector					
28	Rural Collector	13,448	14,156	189,575	217,180	
29	Urban Collector	8,374	10,954	90,960	110,288	
30	**Total**	**21,822**	**25,110**	**280,535**	**327,467**	
31	Local					
32	Rural Local	727	984	26,600	28,312	
33	Urban Local	4,149	5,692	46,668	56,510	
34	**Total**	**4,877**	**6,676**	**73,268**	**84,821**	
35	Ramp					
36	Ramp	8,011	9,673	92,424	110,107	
37	Connector					
38	Zone Connector	22,382	26,843	244,084	293,309	
39	**TOTAL**	**330,618**	**367,368**	**4,590,615**	**5,288,601**	
40						
41	VEHICLE HOURS OF TRAVEL, FREE-FLOW SPEEDS					
42	Freeway					
43	Freeway	1,695	2,012	31,138	34,846	

Meas_SH05 | Meas_SH10 | Meas_SH10N | Meas_SH1 ...

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