District 10 Forecasting and Model Training Workshop

Date: September 6, 2017 Location: Dist.3, 703 B Street, Marysville

Time: 8am to 4pm

1. **Introductions (briefly state your role in your organization/division)**
2. **Tri-county Model brief structure**
3. **Go over 4 steps (brief overview of network along with what kind of macros/code does this model have and how to run all 4 steps combined or each step separately).**
4. **Trip Gen – if we were to change LU, how to change it and re-run the whole model and interpret the results?**

10 MINUTE BREAK

5. **How to identify several scenarios within a model, and identify the correct one since Tri-county may have several network scenarios for each year. How to read network volumes for each period?**
6. **If we were to modify network as follows, what step(s) need to be re-run for logical/accurate results:**
   a. **Change link's functional class, number of lanes.**
   b. **Add a regular SOV link(roadway)**
   c. **Add a HOV link (this might need mode choice or trip dist onward re-run)**

LUNCH BREAK (1 HR. Noon to 1 pm)

7. **How to interpret final assignment volumes side-by-side with counts**
8. **How to run a select link, and zone assignment and interpret the run.**
9. **Brief overview of SR 65 model if time permits**
10. **Conclusion and if time permits for Q&A**

Three County Model Parameter Summary

Scenario Information				
Prefix	THCM_08_Base	THCM_05	THCM_20	THCM_35
Scenario Name	Base	Base	Base	Base
Land Use Year	2008	2005	2020	2035
Network Year	2008	2005	2020	2035
Date Updated	1/18/2012	1/18/2012	1/18/2012	1/18/2012
Updated By	SM	SM	SM	SM
Parameters				
TAZ Data	X	X	X	X
Special Generators	X	2008	2008	2008
Gateways	X	X	X	X
SE_Detail	X	X	X	X
CrossClass_TripRates	X	X	X	X
Friction Factors	X	2008	2008	2008
AutoOwnParam	X	2008	2008	2008
AutoOpCost	X	2008	2008	2008
ModeChoice	X	2008	2008	2008
Transit XY	X	2008	2008	2008
Non-highway transit links	X	2008	2008	2008
Diurnal Factors	X	2008	2008	2008
Traffic_Assignment	X	2008	2008	2008
Turn Pen	X	X	X	X
Through Trips	X	X	X	X
LOS_FDOT	X	2008	2008	2008
Trucks	X	2008	2008	2008

Constants (only list those changed from defaults, assumed for all scenarios)			
Constant	**Initial Value**	**Updated Value**	**Notes**

THCM_40	
Base	
2040	
2040	
1/18/2012	
SM	
	Notes
X	
2008	No info for other years
X	
X	
X	
2008	Universal values, using those exported from 2008 PW
2008	Universal values, using those exported from 2008 PW
2008	Universal values, using those exported from 2008 PW
2008	Universal values, using those exported from 2008 PW
2008	Rail
2008	Rail
2008	
2008	
X	Input files are scenario-specific, but all have same values
X	
2008	Universal values, using those exported from 2008 PW
2008	Truck process in development, no future year data yet

Constant Name
Land Use Development
Land Use Year
Road Network Inputs
Network Year
TAZ Identification
Number of Zones
Non-motorized values
Bike Speed
Walk Speed
Maximum Bike Distance
Maximum Walk Distance
Transit time factors
Transit Time Factors by facility - Freeway
Transit Time Factors by facility - Highway
Transit Time Factors by facility - Expressway
Transit Time Factors by facility - Arterial
Transit Time Factors by facility - Collector
Transit Time Factors by facility - Local
Transit Time Factors by facility - Ramp Fwy to Fwy
Transit Time Factors by facility - Ramp Slip
Transit Time Factors by facility - Ramp Loop
Value of time
Value of Time - 0 Vehicles
Value of Time - 1 Vehicles
Value of Time - 2 Vehicles
Auto Occupancy factors for Shared Ride 3+
Auto Occupancy Factor, Home-Work Trip Purpose, Shared Ride 3+
Auto Occupancy Factor, Home-Shop Trip Purpose, Shared Ride 3+
Auto Occupancy Factor, Home-K12 Trip Purpose, Shared Ride 3+
Auto Occupancy Factor, Home-College Trip Purpose, Shared Ride 3+
Auto Occupancy Factor, Home-Other Trip Purpose, Shared Ride 3+
Auto Occupancy Factor, Work-Other Trip Purpose, Shared Ride 3+
Auto Occupancy Factor, Other-Other Trip Purpose, Shared Ride 3+
Auto Occupancy Factor, Highway Trip Purpose, Shared Ride 3+
Mode Choice
Mode Choice Constant Shift
Trip Distribution
Equivalent time scaling factor for friction factors - Work, 0 vehicles
Equivalent time scaling factor for friction factors - Work, 1 vehicles
Equivalent time scaling factor for friction factors - Work, 2+ vehicles

Equivalent time scaling factor for friction factors - NonWork, 0 vehicles
Equivalent time scaling factor for friction factors - NonWork, 1 vehicles
Equivalent time scaling factor for friction factors - NonWork, 2+ vehicles
Distribution Iterations, Singly Constrained
Distribution Iterations, Doubly Constrained
Truck Distribution Iterations, Doubly Constrained
Assignment Iterations Peak
Assignment Iterations Off-Peak

Trip Assignment

AM Period Hours
Mid-day Period Hours
PM Period Hours
Night-time Period Hours
AM Peak Period Hour
PM Peak Period Hour
Capacity Factor AM Period
Capacity Factor Mid-day Period
Capacity Factor PM Period
Capacity Factor Night-time Period
Passenger Car Equivalent - Small Truck
Passenger Car Equivalent - Medium Truck
Passenger Car Equivalent - Heavy Truck

Truck Freeway Speed Factor

Land Use Model

PROJECT
AgentChars
RunLand

Description	Variable Name	Sample Value
	Year	2008
	Net_Year	2008
	NumZones	6600
	Speed_Bike	10
	Speed_Walk	3
	MaxBikeDist	100
	MaxWalkDist	60
To increase time of transit relative to highway network	TimeFacB_1	1
	TimeFacB_2	1
	TimeFacB_3	1
	TimeFacB_4	1
	TimeFacB_5	1
	TimeFacB_6	1
	TimeFacB_7	1
	TimeFacB_8	1
	TimeFacB_9	1
Placeholders - values will be calculated from data	VOT_0Veh	6
	VOT_1Veh	12
	VOT_2Veh	18
	AOF_HW_SR3	4.35
	AOF_HS_SR3	3.65
	AOF_HK_SR3	4.35
	AOF_HC_SR3	4.35
	AOF_HO_SR3	3.42
	AOF_WO_SR3	3.16
	AOF_OO_SR3	3.37
	AOF_HY_SR3	4.35
	MC_Const_Shift	2
	ET_Wrk_0Veh	2.2
	ET_Wrk_1Veh	1.4
Brings equivalent time into friction factor lookup range. Based on ratio of impedence equivalent time and free flow	ET_Wrk_2Veh	1.4

Based on ratio of impedence equivalent time and free flow travel time	ET_NonWrk_0Veh	2.2
	ET_NonWrk_0Veh	1.4
	ET_NonWrk_0Veh	1.4
	Dist_Iters_Single	20
	Dist_Iters_Double	20
	Dist_Iters_Truck	20
	Assign_Iter_Peak	50
	Assign_Iter_OffPeak	20
Cube definition of range: 7-9 means 7,8,9	AMPER_HOURS	7-9
	MDPER_HOURS	10-16
	P3PER_HOURS	17-19
	NTPER_HOURS	1-6,20-24
	A1PER_HOURS	8
	P1PER_HOURS	18
	CAPFAC_A3	2.632
	CAPFAC_MD	11.111
	CAPFAC_P3	2.941
	CAPFAC_NT	11.111
	TS_PCE	1
	TM_PCE	1.5
	TH_PCE	2
	Truck Freeway Speed Factor	0.85
	PROJECT	
	AgentChars	
	RunLand	

Source	Who should modify	How often should be modified
Cube application key	Model User	Often
Cube application key	Model User	Often
Cube application key	Model Developer	Rarely
Cube application key	Model Developer	Rarely
Cube application key	Model Developer	Rarely
Cube application key	Model Developer	Rarely
Cube application key	Model Developer	Rarely
Cube application key	Model Developer	Rarely
Cube application key	Model Developer	Rarely
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Cube application key	Model Developer	Rarely
Cube application key	Model Developer	Rarely
Cube application key	Model Developer	Rarely
Cube application key	Model User	Rarely
Cube application key	Model User	Rarely
Cube application key	Model User	Rarely
Cube application key	Model User	Rarely
Cube application key	Model User	Rarely
Cube application key	Model User	Rarely
Cube application key	Model Developer	Rarely
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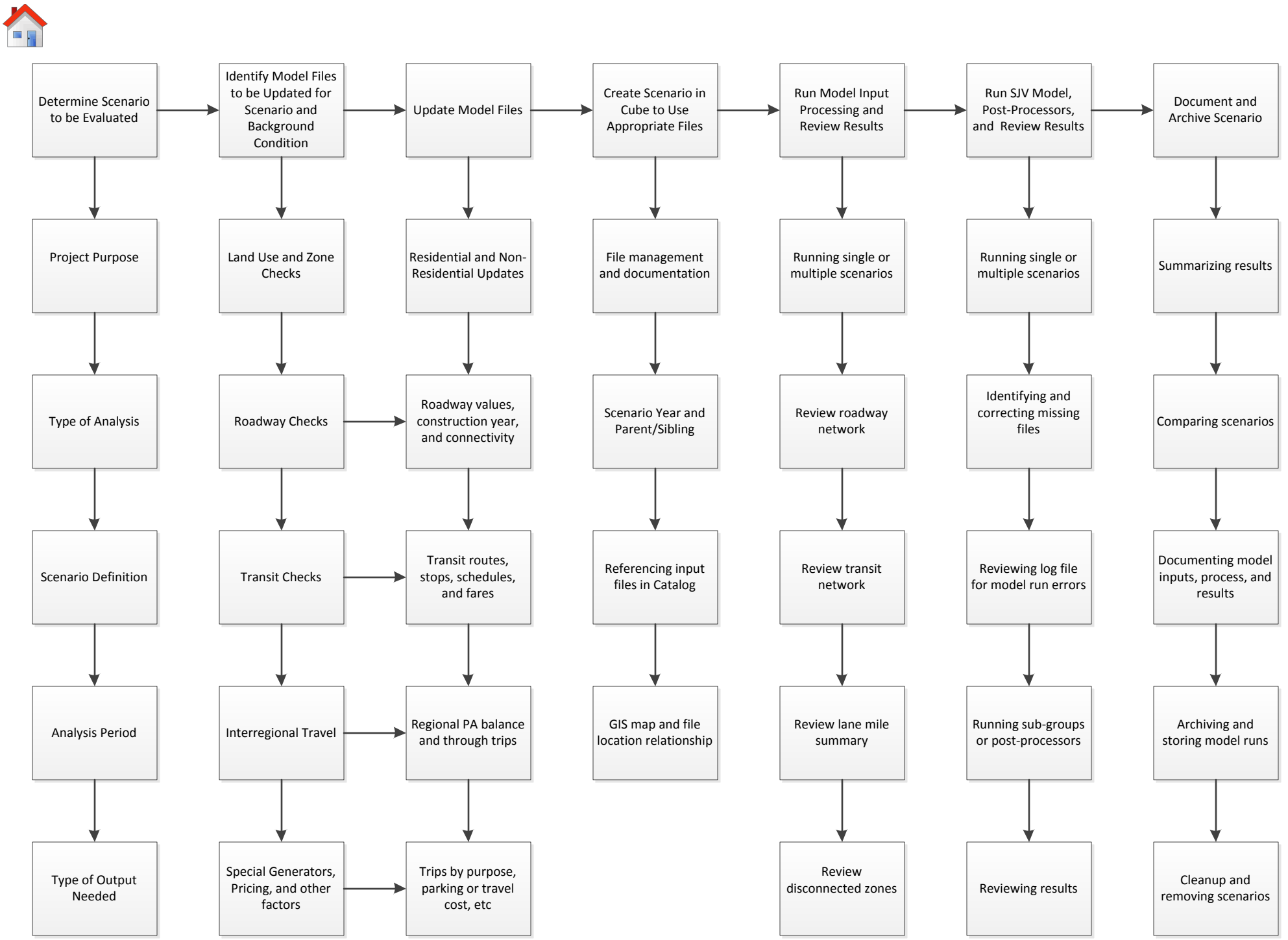
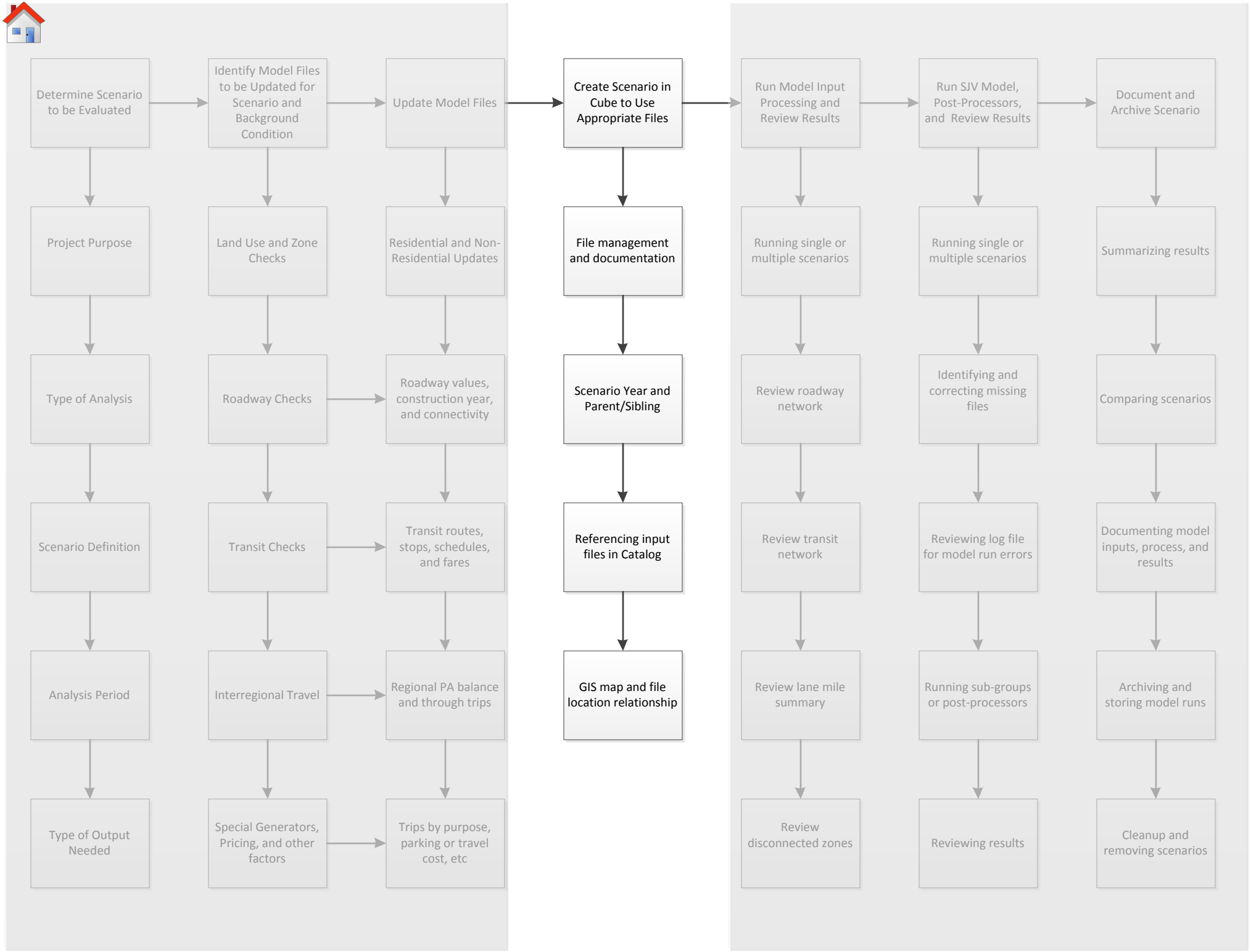
Cube application key	Model Developer	Rarely


Determine Scenario to be Evaluated
Identify Model Files to be Updated for Scenario and Background Condition
Update Model Files
Create Scenario in Cube to Use Appropriate Files
Run Model Input Processing and Review Results
Run SJV Model, Post-Processors, and Review Results
Document and Archive Scenario
Project Purpose
Land Use and Zone Checks
Residential and Non-Residential Updates
File management and documentation
Running single or multiple scenarios
Running single or multiple scenarios
Summarizing results
Type of Analysis
Roadway Checks
Roadway values, construction year, and connectivity
Scenario Year and Parent/Sibling
Review roadway network
Identifying and correcting missing files
Comparing scenarios
Scenario Definition
Transit Checks
Transit routes, stops, schedules, and fares
Referencing input files in Catalog
Review transit network
Reviewing log file for model run errors
Documenting model inputs, process, and results
Analysis Period
Interregional Travel
Regional PA balance and through trips
GIS map and file location relationship
Review lane mile summary
Running sub-groups or post-processors
Archiving and storing model runs
Type of Output Needed
Special Generators, Pricing, and other factors
Trips by purpose, parking or travel cost, etc
Review disconnected zones
Reviewing results
Cleanup and removing scenarios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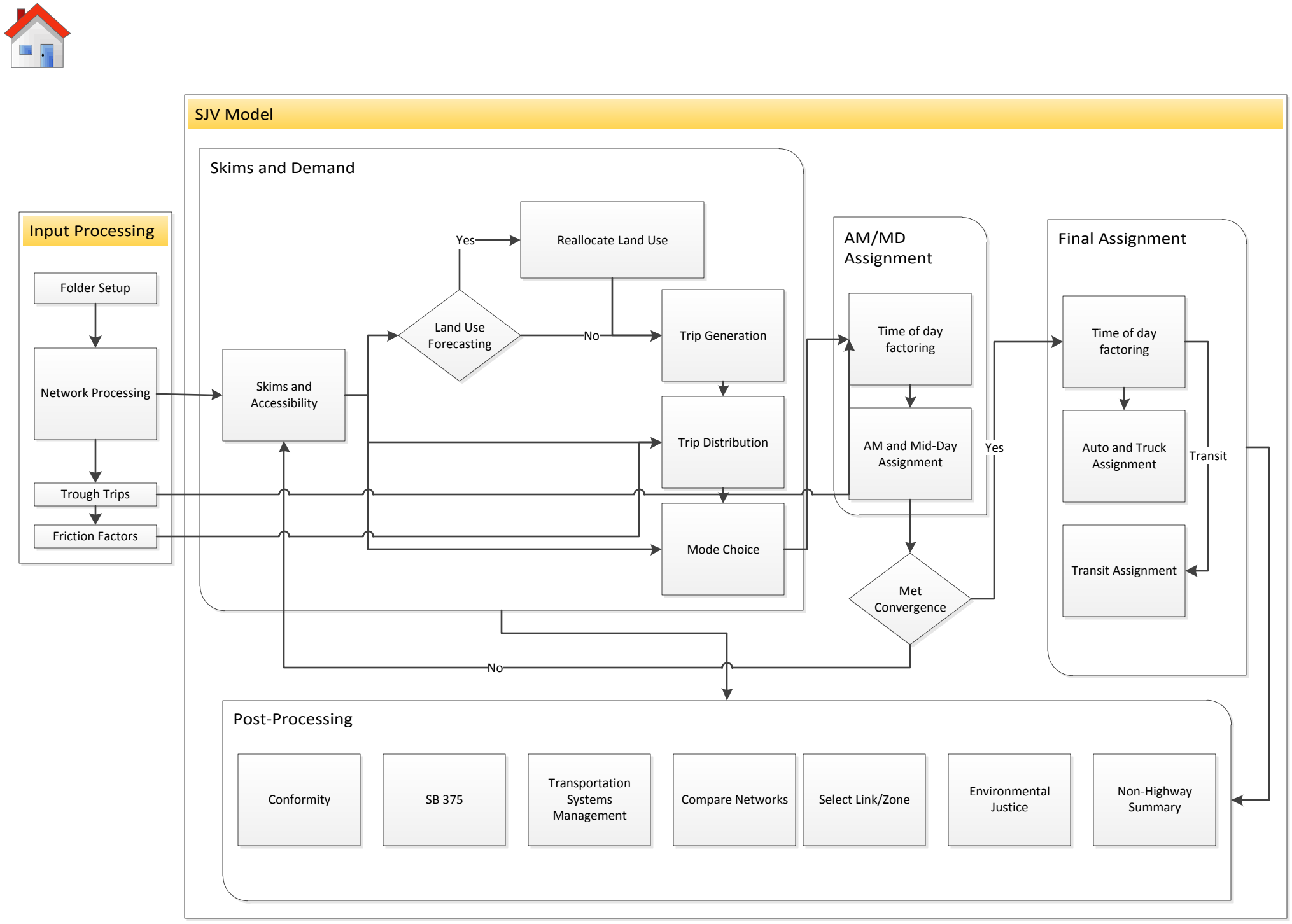
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Network Processing
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Friction Factors
Skims and Accessibility
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Reallocate Land Use
No
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AM and Mid-Day Assignment
Met Convergence
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Final Assignment
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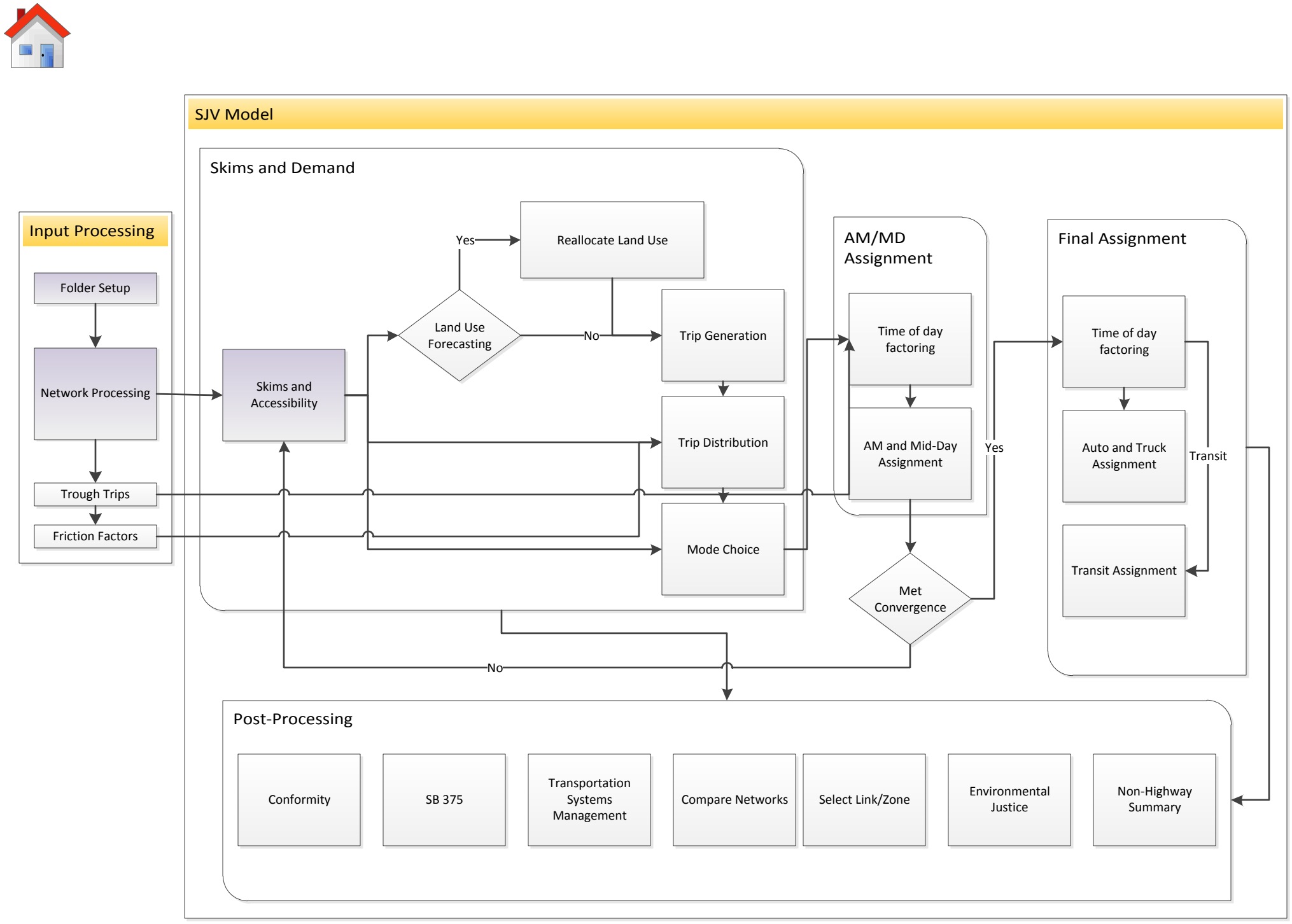
Transportation Systems Management
Compare Networks
Select Link/Zone
Environmental Justice
Non-Highway Summary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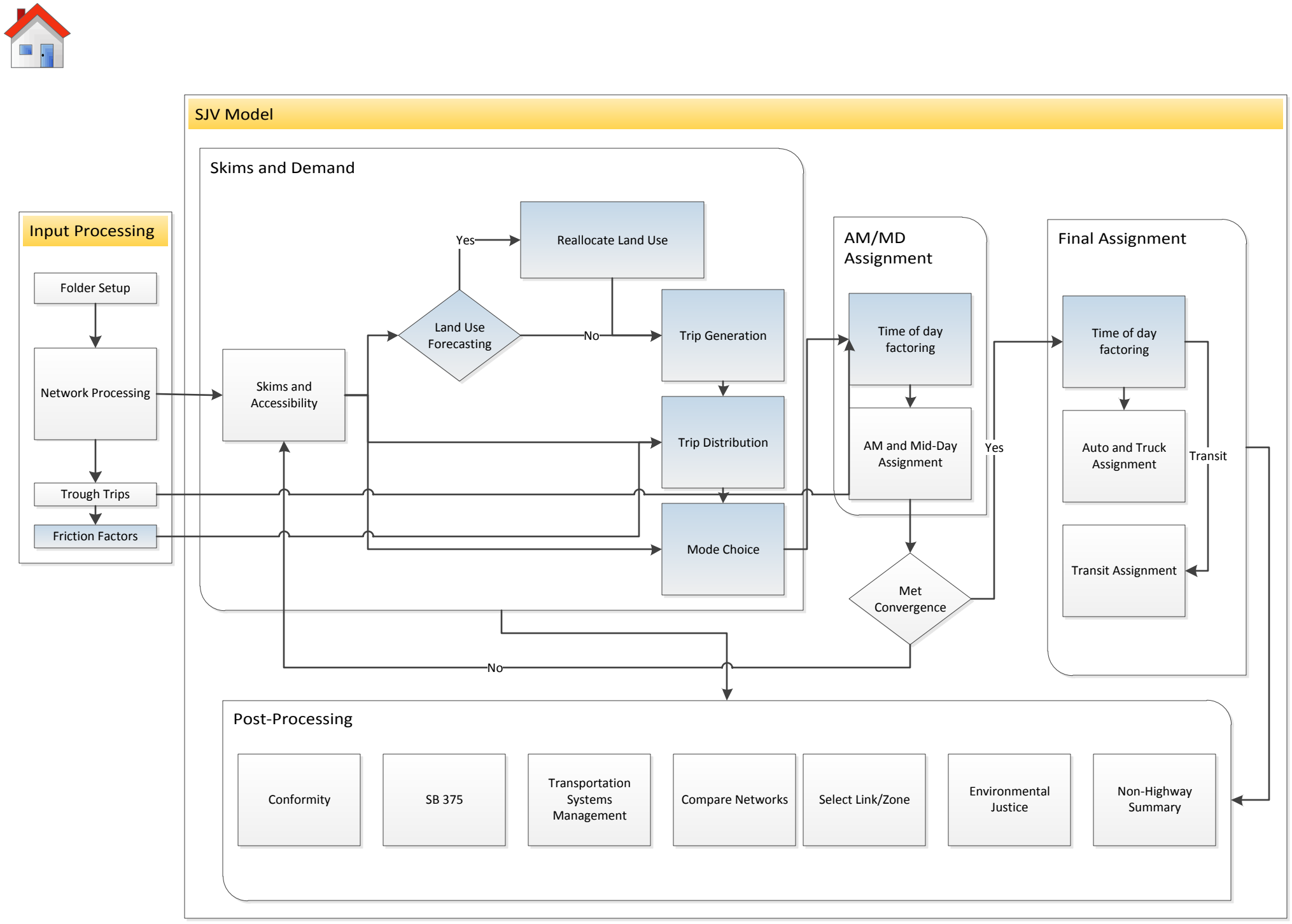
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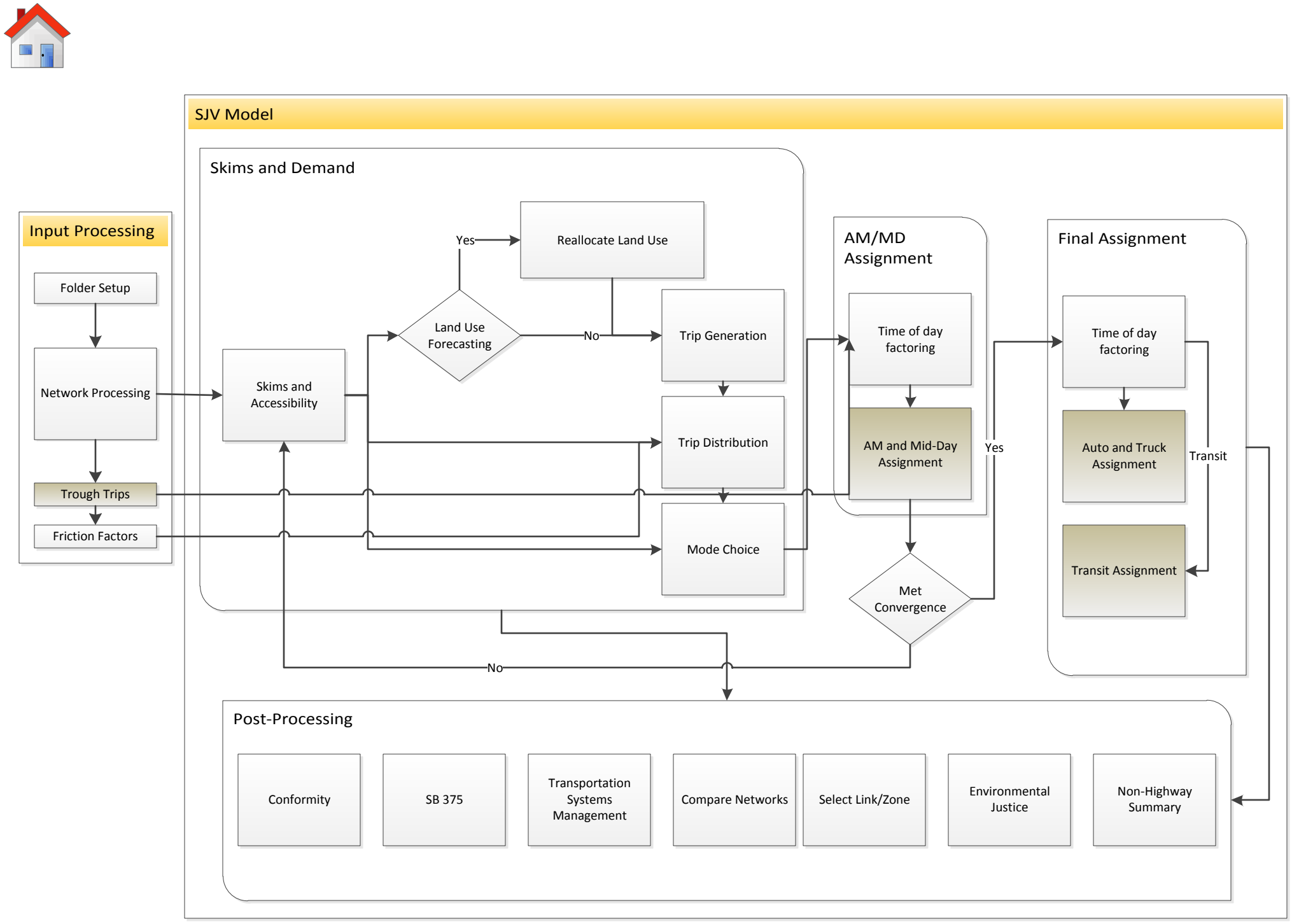
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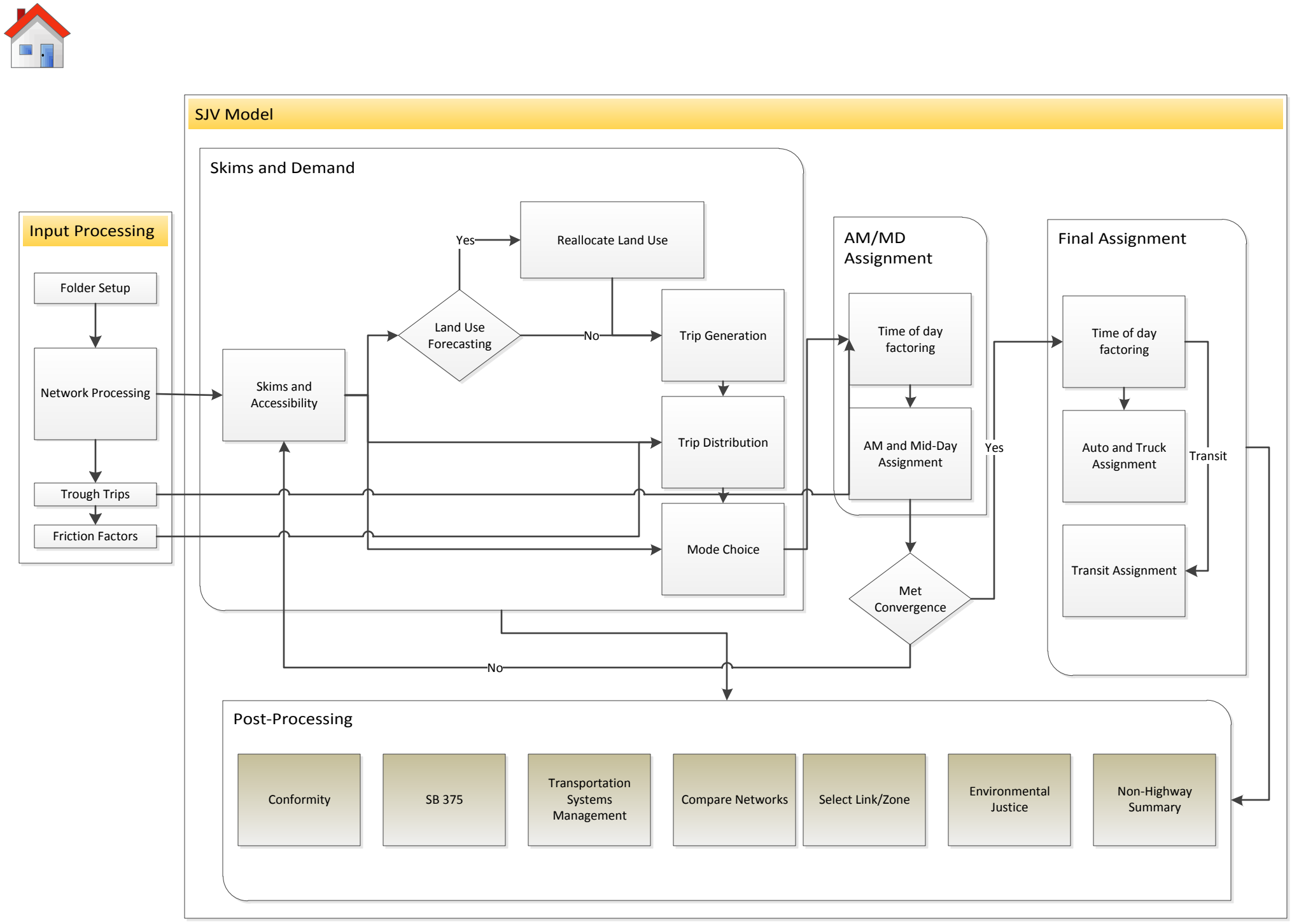
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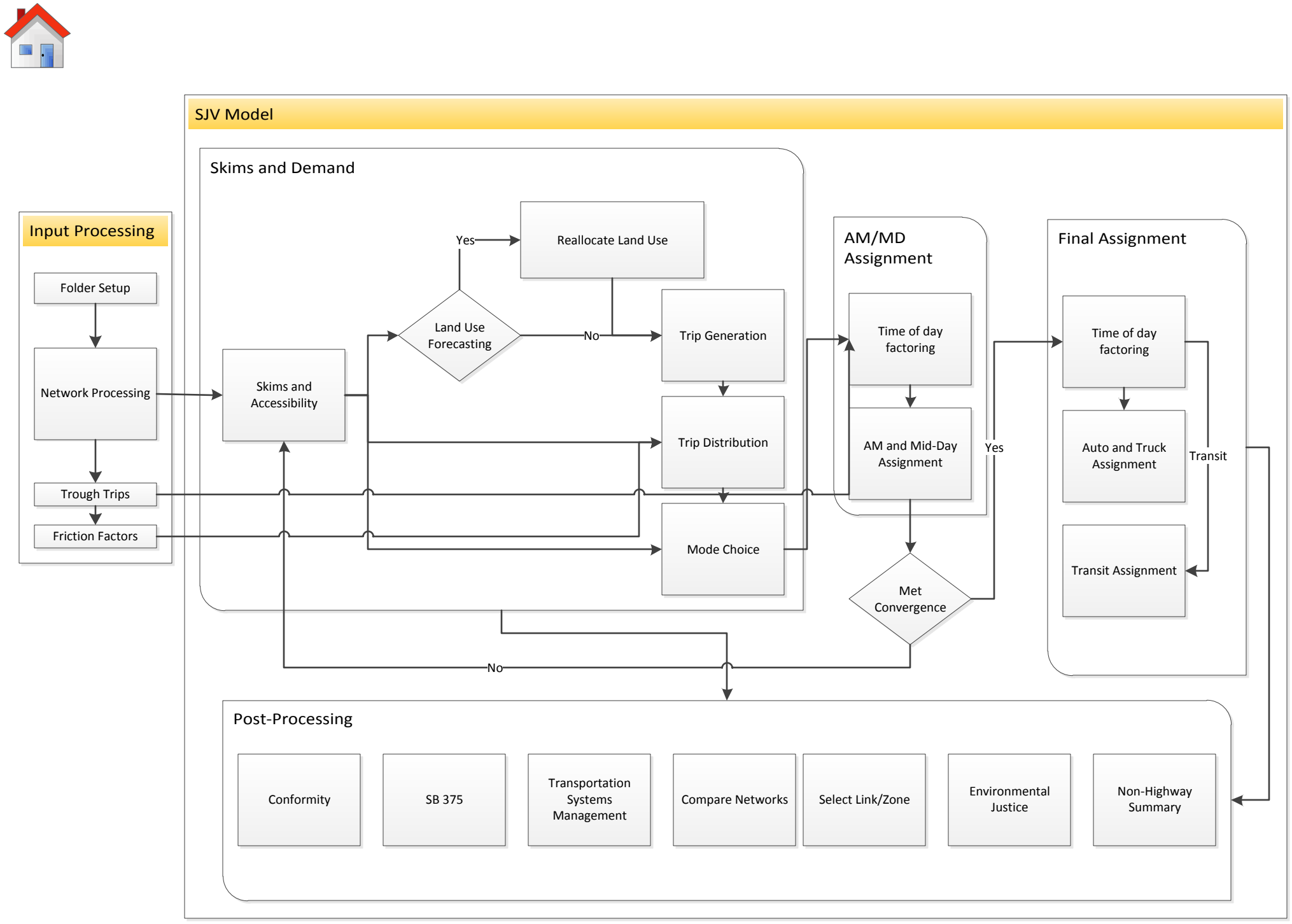
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INSTALL, SETUP, AND RUN THE MODEL

This section describes preparing a computer that does not currently have Cube or the model installed, and includes an overview of the software installation, setting up the model as received, running the scenarios that correspond to the validation year and RTP scenario as entire model or specific sub-group applications, and running the post-processors.

INSTALLING THE SOFTWARE

The model was developed and tested using **Cube 6.1.1 and ArcGIS 10.2**. Newer versions of both software have been made available since the model was development and they should not be used with the files accompanying this model.

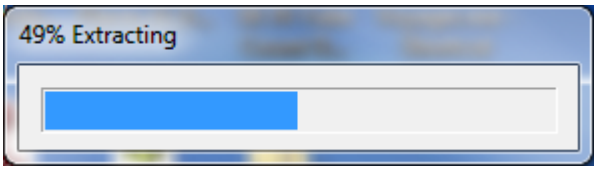
SOFTWARE LICENSING

- Required: Cube Base and Cube Voyager
- Recommended: Cube Cluster
- Optional: Cube Land

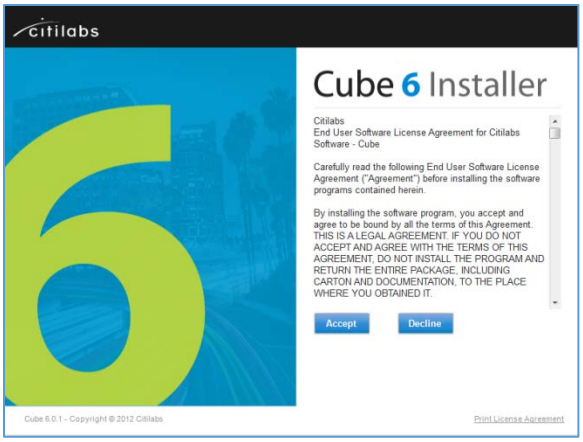
SOFTWARE SETUP

Installation Procedure

- Locate the Cube setup file included with the deliverables. This will be Version 6.0.1, with ArcGIS Support. Double click the ***.exe*** file to initiate the install.
- The Windows installer will extract the necessary files. This may take a few minutes.



- The Cube 6 Installer welcome screen will open. Review the End User Software License Agreement and click ***Accept***.

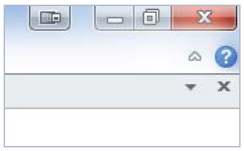


- Review the software eligible to be installed with your licensing. Cube Base, Cube Voyager, Cube Cluster (Recommended) or Cube Land (Optional) may be listed depending on the installed license. Click ***Install***.

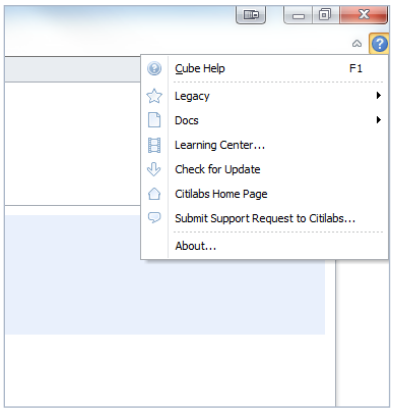
- Once the installation is complete, click ***Exit*** to close the application. To automatically open Cube or the *What's New* documentation, leave each box checked. Otherwise uncheck both boxes.

Review Software Version

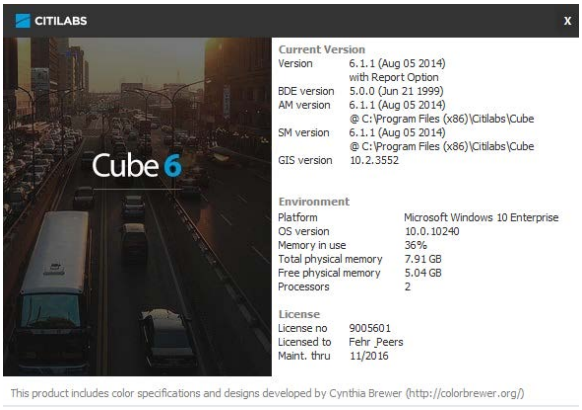
- Open Cube6 via the Start menu or by double-clicking the icon on your desktop
- Verify the version of your software
    - Click on the ***question mark*** at the top right corner of the program window.



    - Click ***About…*** in the drop down menu.



    - Review and note the Version, License No., and Processors of Cube 6



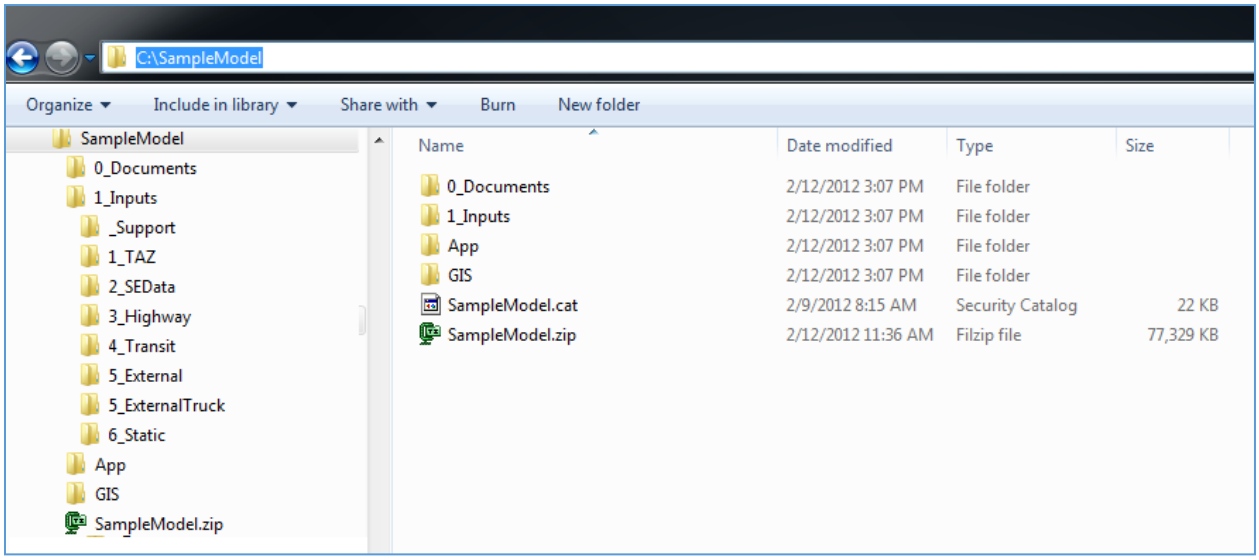
MODEL FILE SETUP

Install Model

- Unzip the contents to a directory where you would like to store the model run data.
    - This can be on a different drive or partition than the Citilabs software
    - It is recommended that the directory be local rather than on the network and have at least 10GB of storage for each scenario than you plan to run

File Descriptions

- The directory structure for the model will look similar to the image below, along with a general description of each directory and its contents.



  - 0_Documents – Documentation and support documents not directly related to the model run itself. Contents and description of this directory:

    - Validation – Directory containing validation spreadsheets for the base year. Summaries for non-validation year scenarios are included in the 01_Inputs_Support directory. See Review Model Outputs for more information on the scenario summary spreadsheets used for validation.

    - VMIP 2 Model User Guide 2016September.docx – This document. User guide on running the model, preparing and evaluating scenarios, and reporting results.

    - XX Model Development Report 2016September.docx – General development report for VMIP 2 models customized for with values specific to each model. Detailed model validation for each model is also included.

  - 1_Inputs – The inputs listed by type for SB 375 scenario years and the validation year

    - _Support – This directory has scenario summary spreadsheets and scenario preparation files used to generate the inputs in the other input directories. Within the "1_Inputs_Support" directory there are Excel spreadsheets for preparing a majority of the scenario data. The model as delivered contains the data for the SB 375 scenario years and the validation year.

      - Tools – Recommended directory for post-processor related files

    - FratarTrips.dbf – Exampled file used to match trip generation using the Fratar process during the select link assignment post-processor.

    - RailStationTrips.dbf – Exampled file used to designate boarding values and external travel for the interregional transit post-processor

    - SJV MIP Quick Response Tool Template Final.xlsx – The quick-response tool allows the user to quickly determine impacts of smart growth, travel demand management (TDM), and transportation system management (TSM) in an off-model tool.

- !!XX Scenario Summary.xlsx – Summary of scenario inputs and change from default parameters. This file is used to document and summarize each scenario, the data files to export from the scenario prep workbook, and the key values to modify in the Cube Application. The file begins with !! to have it always at the top of the directory listing.

- VMIP2_XX_LandUsePrep.xlsx – Prepare and summarize land use by zone and planning area.

- VMIP2_XX_ScenarioPrep.xlsx – Review local and interregional assumptions relating to land use, socio-economic, and TAZ then export information for scenario model run and evaluation. Auto operating cost calculation for all SJV MPO models based on the fuel and non-fuel costs method developed by the Big 4 MPOs with Big 4 MPOs included.

- VMIP2_XX_Parameters.xlsx – Parameters used in model development such as vehicle availability, mode choice, friction factors, and trip generation rates. This file is primary for documentation or future model calibration and the values are not directly used by the model.

- 1_TAZ though 10_Reporting – Recommended directory structure and default output location from the Scenario Prep workbooks to organize input data. Nearly all input files are exported from the input workbook in CSV format. The exceptions to this are:

    - 3_Highway – Master network in geodatabase (and associated turn penalty .pen file) or Voyager binary .NET format. The SelectLink assignment and summary text files are also recommended to be stored in this directory.

    - 4_Transit – Drive access block file, walk access block file, and transit line file in plain text format. For models using a geodatabase, the transit lines are in the geodatabase referred to in the highway directory

- 5_Trucks – Files from the interregional goods movement model: Auto and Truck interregional matrix files in Voyager binary .MAT format, Regional and sub-area network in Voyager .Net format
- 6_Static – transit fare (FAR), public transport system (PTS), and transit factors (FAC) files in plain text format

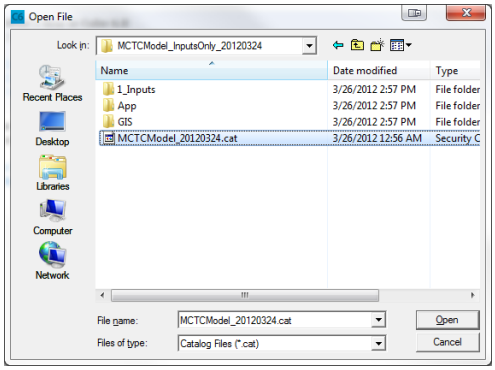
o App – The scripts and applications for the model. This directory should not be modified except to review or delete PRN files for model runs, and all changes to the scripts should be made from the Cube Catalog.

o GIS – master geodatabase with base GIS layers, blank personal geodatabase and default map documents used to create scenario specific geodatabases, Model map document containing links to all SB 375 scenario input summary data.

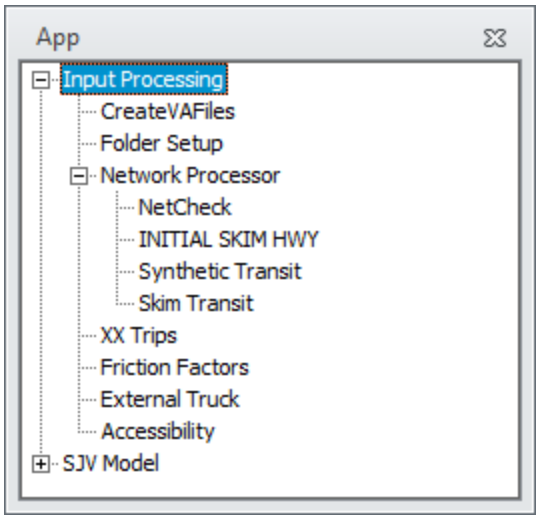
RUNNING THE MODEL

UPDATE MODEL DIRECTORY STRUCTURE

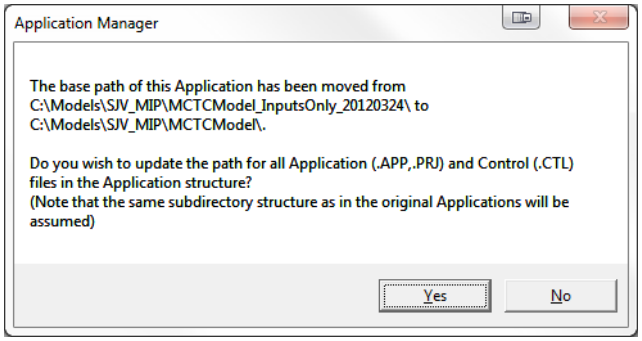
- Open Cube and click ***Open Catalog***
- Navigate to the catalog file and click ***Open***



- When the model catalog open's, double-click on ***Input Processing*** in the Application Manager (App) window pane.



- The first time you open the application, you will be asked to update the application directory. Click ***Yes***. This will ensure that the model runs properly.

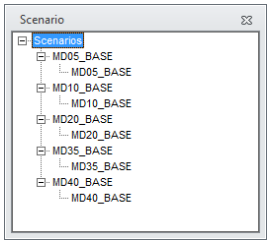


- Double-click and update the paths for ***SJV Model*** in the App window pane.

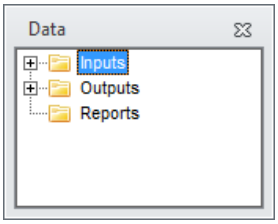
NAVIGATING APPLICATION MANAGER

Window Panes

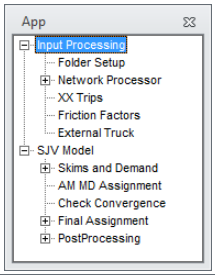
Once you open your model catalog, you will see four windows, or panes, to the left of the program window. They are as follows:



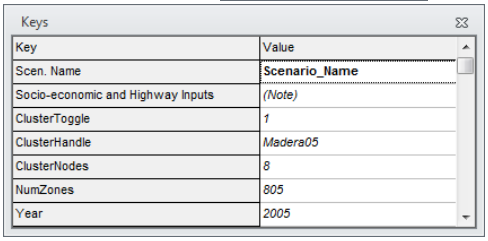
- Scenario Pane
  - Scenarios are hierarchical in nature.
  - Child or sibling scenarios can be added to create variations on the "base" scenario.
  - Child scenarios inherit key values from its parent.



- Data Pane
  - Provides a means of viewing/editing the input files for an application.
  - Lists output files and reports from an application run.



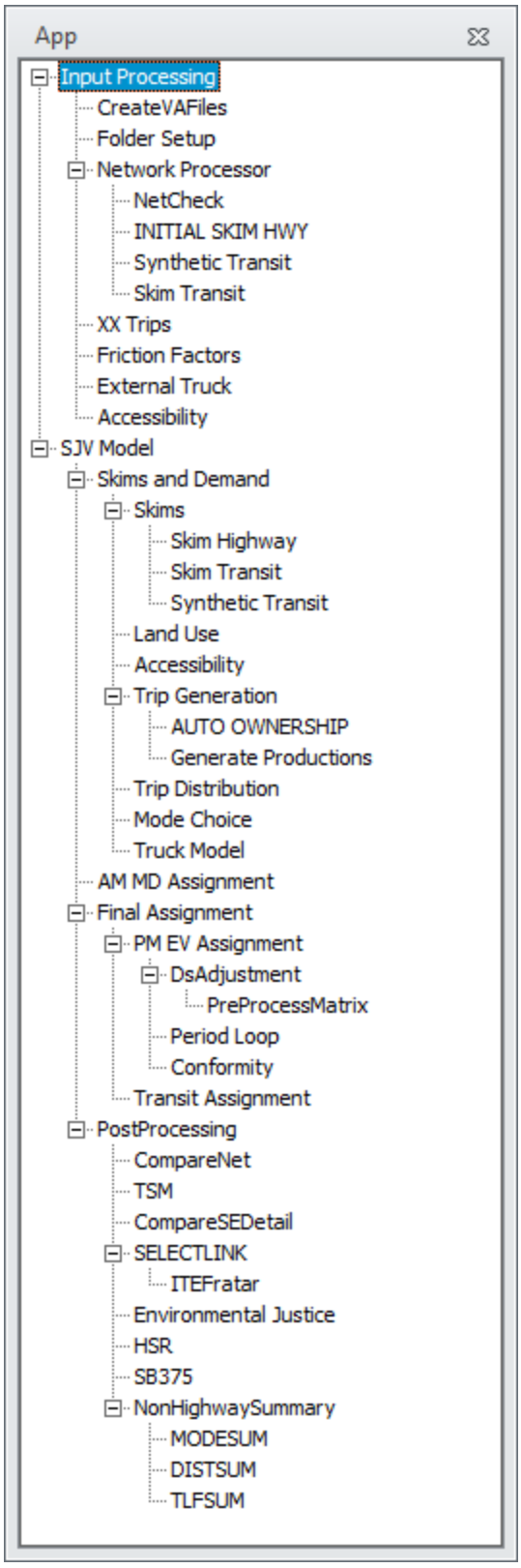
- Application (App) Pane
  - Organizes model applications.
  - Helps the user navigate through the model and quickly access sub-routines.



- Keys Pane
  - Lists catalog keys and associated values referenced in the model script.
  - Key list and values may change depending on the scenario.

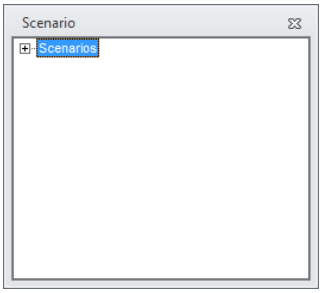
You can modify the panes by resizing, moving, overlapping, or auto-hiding them to suit your needs. For more information, please refer to the Scenario Manager section in Cube 6 Help.

The entire model structure with sub-groups expanded is below.

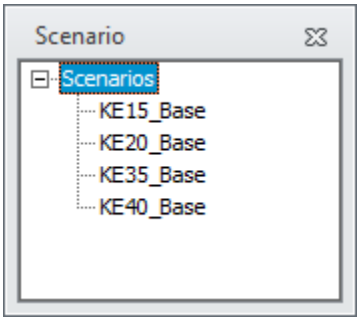

App
Input Processing
CreateVAFiles
Folder Setup
Network Processor
NetCheck
INITIAL SKIM HWY
Synthetic Transit
Skim Transit
XX Trips
Friction Factors
External Truck
Accessibility
SJV Model
Skims and Demand
Skims
Skim Highway
Skim Transit
Synthetic Transit
Land Use
Accessibility
Trip Generation
AUTO OWNERSHIP
Generate Productions
Trip Distribution
Mode Choice
Truck Model
AM MD Assignment
Final Assignment
PM EV Assignment
DsAdjustment
PreProcessMatrix
Period Loop
Conformity
Transit Assignment
PostProcessing
CompareNet
TSM
CompareSEDetail
SELECTLINK
ITEFratar
Environmental Justice
HSR
SB375
NonHighwaySummary
MODESUM
DISTSUM
TLFSUM

Selecting a Scenario

- Locate the Scenario pane and click the ***[+]*** beside Scenarios

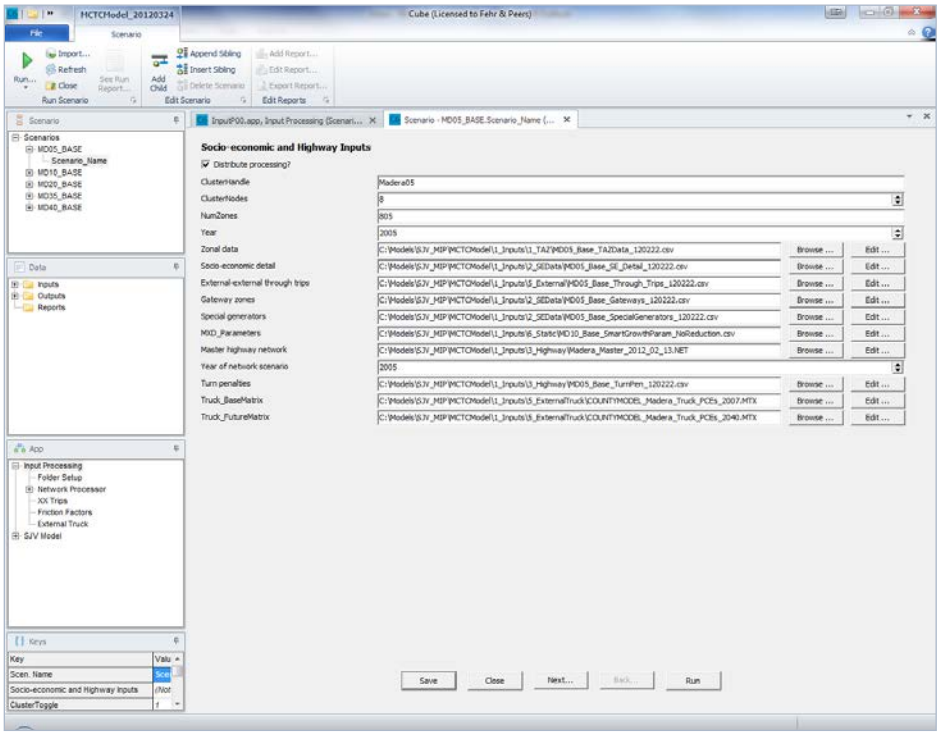


- Click the ***scenario name*** within the model year you would like to select

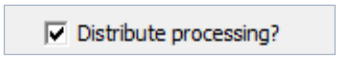


Checking input keys

- Double-click on the scenario you would like to review
- Review the Socio-economic and Highway Inputs.

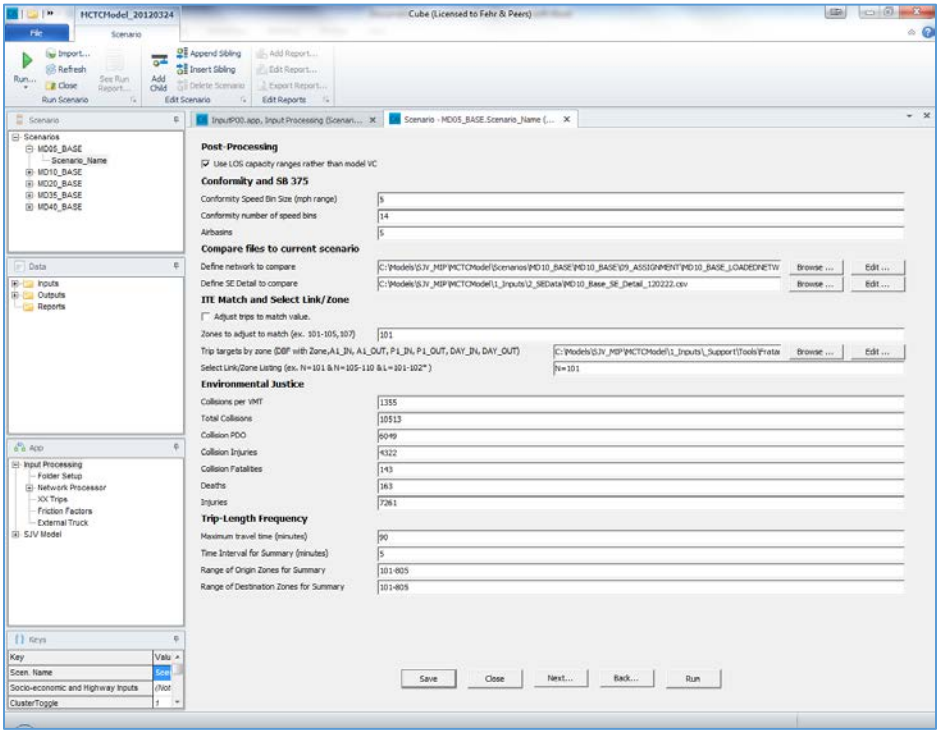


- If your model utilizes Cube Cluster, verify that ***Distribute processing?*** is checked. Otherwise, uncheck it.

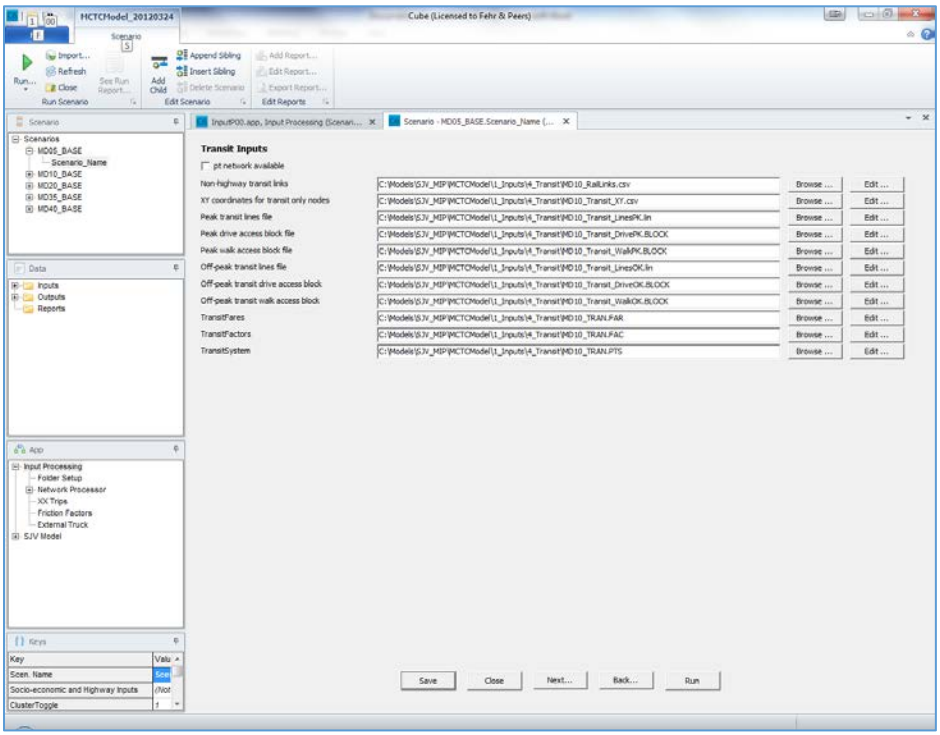


- **Note:** If ***Distribute processing?*** is checked, set the number of ***ClusterNodes*** to be 1 less than the number of core processors your computer has. This will prevent the model from utilizing 100% of the computer's CPU. If your computer has less that 2 core processors, do not use Cube Cluster.
- Click ***Next…***

- Review the Post-Processing inputs and assumptions.

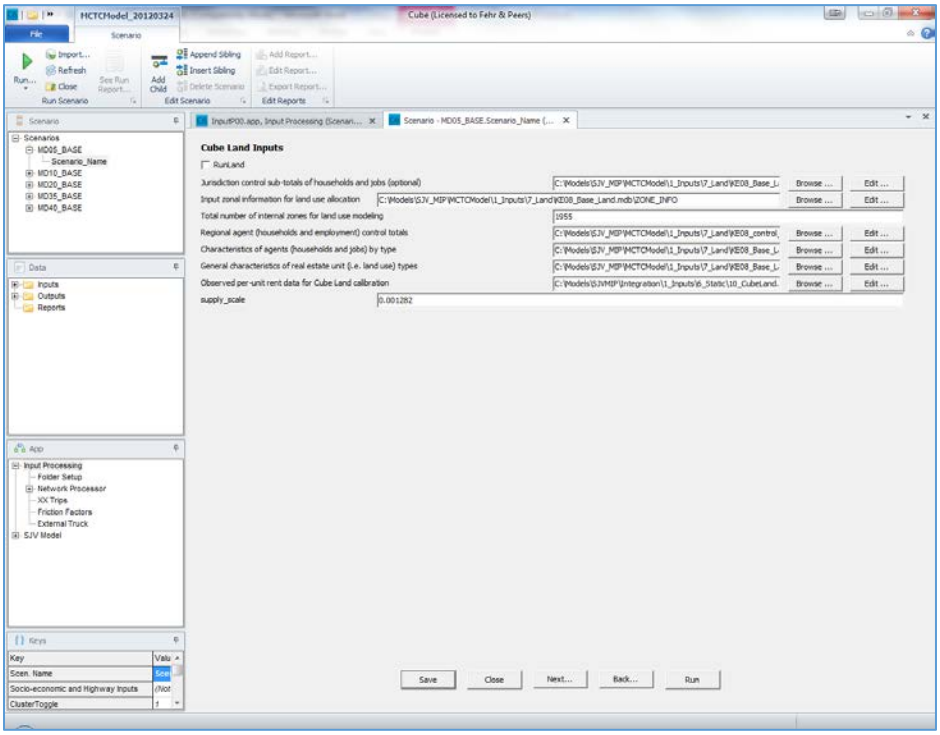


- Click ***Next…***
- Review the Transit Inputs.

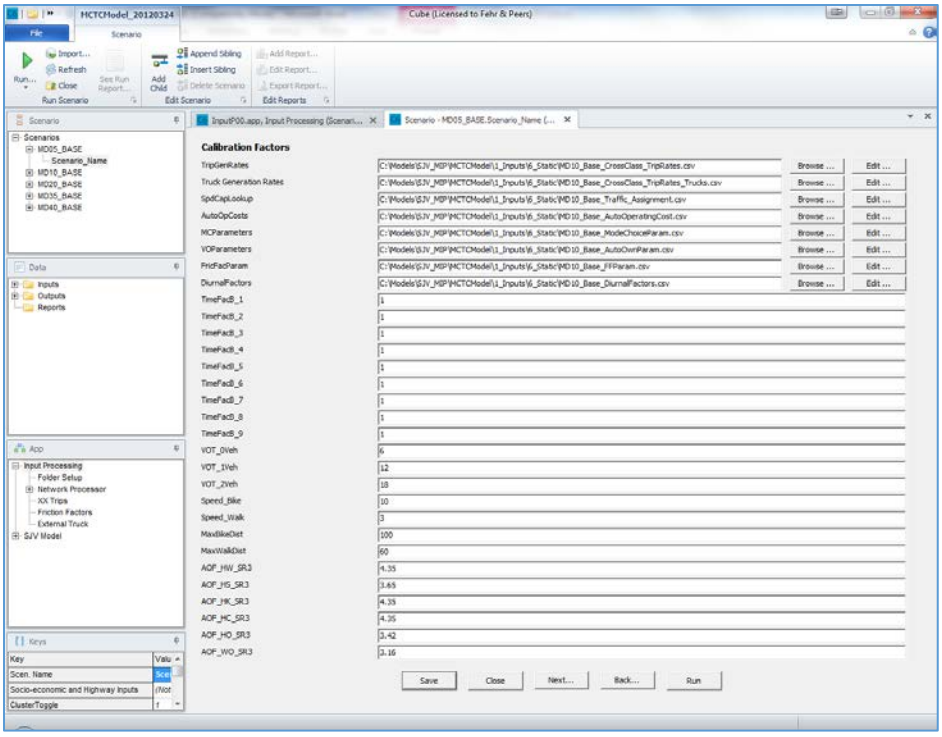


- If your model has transit, verify that ***pt network available*** is checked. Otherwise, uncheck it.

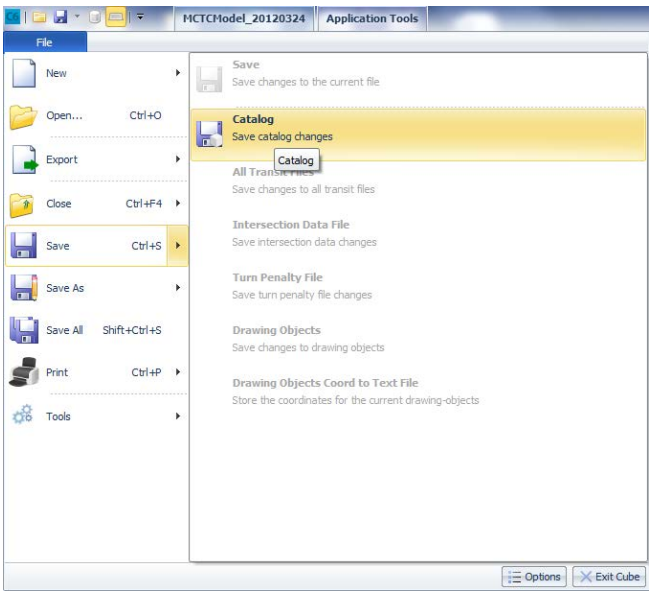
- Click ***Next…***
- Review the Cube Land Inputs.



- If you would like to run Cube Land, verify that ***RunLand*** is checked. Otherwise, uncheck it.
- Click ***Next…***
- Review the model Calibration Factors.

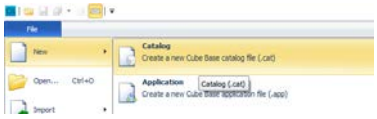


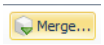
- Click ***Next…***
- Review the remaining model Calibration Factors.
- If you make any changes, click ***Save*** then ***Close***. Otherwise, click ***Close***.
- To navigate back to any windows you have passed, click ***Back…***
- <u>Do not click ***Run***</u> to run the model. It is difficult to know which application will be selected.
- Once you exit the inputs tab, be sure to save the catalog file if any changes were made. Click ***File***, then ***Save***, then select ***Catalog***.



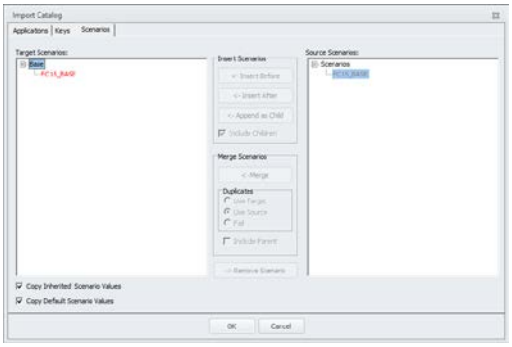
Importing Scenarios

When the catalog is used for many scenarios or multiple catalogs are used, merging or cleaning the catalog might be needed. To copy or merge scenarios it is very important to remember the parent/child structure of the scenarios and is often best to either delete scenarios (using caution with parent) or create a clean catalog and merge the scenarios as needed.

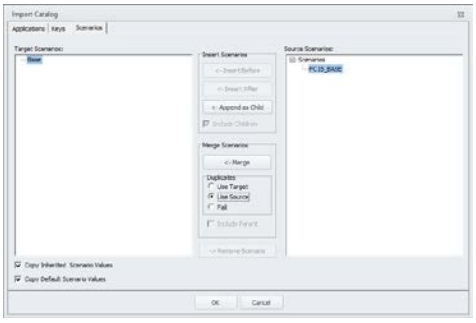
- Create a new Catalog under the File menu and save as a new name, or start with the original as delivered clean catalog to copy the information to 

- Click on 

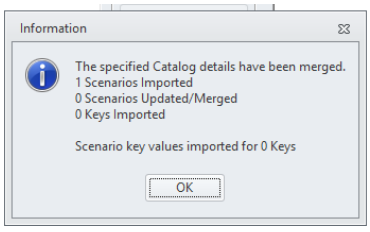
and select the catalog that contains the scenarios to import.
- Select the Scenarios menu, and the scenario on the target and source. For new scenario most often the option will be Append as Child. The new scenario shows in red.



- When replacing the values in a scenario with the same name, select Merge and Use Source.



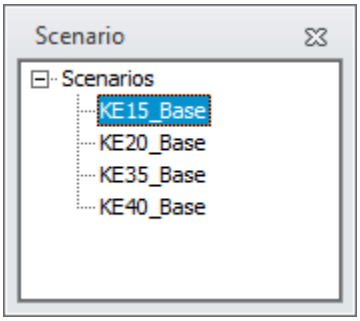
- Click OK and then save the catalog.



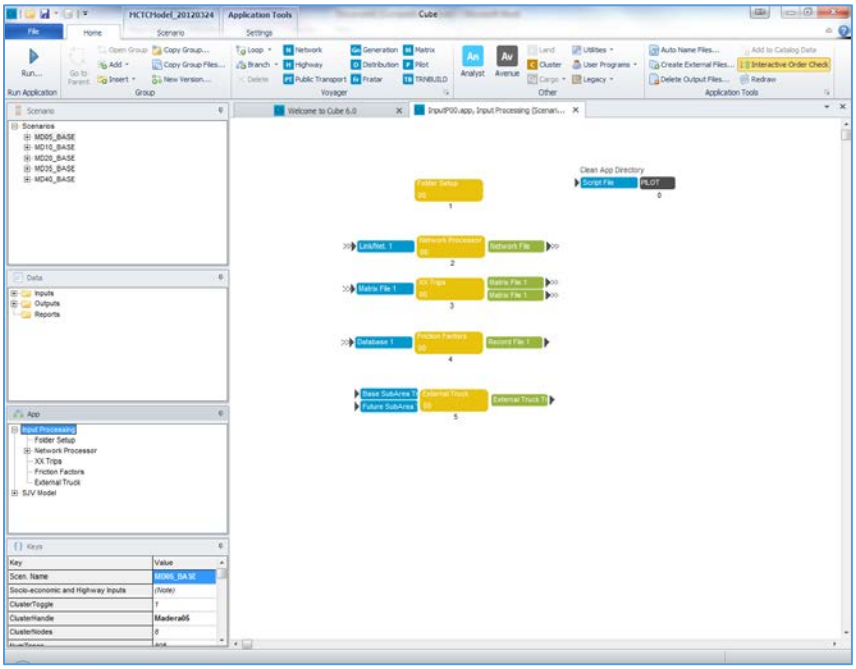
INPUT PROCESSING

Before running the SJV Model application, run the Input Processing application to prepare the input files and folder structure needed for the full model run.

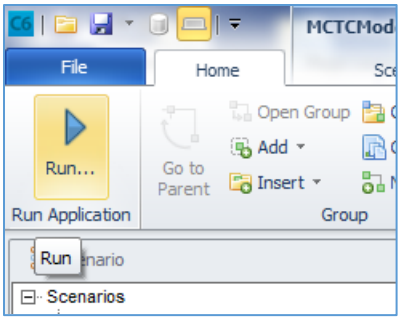
- Select the scenario you will run in the Scenario Pane.



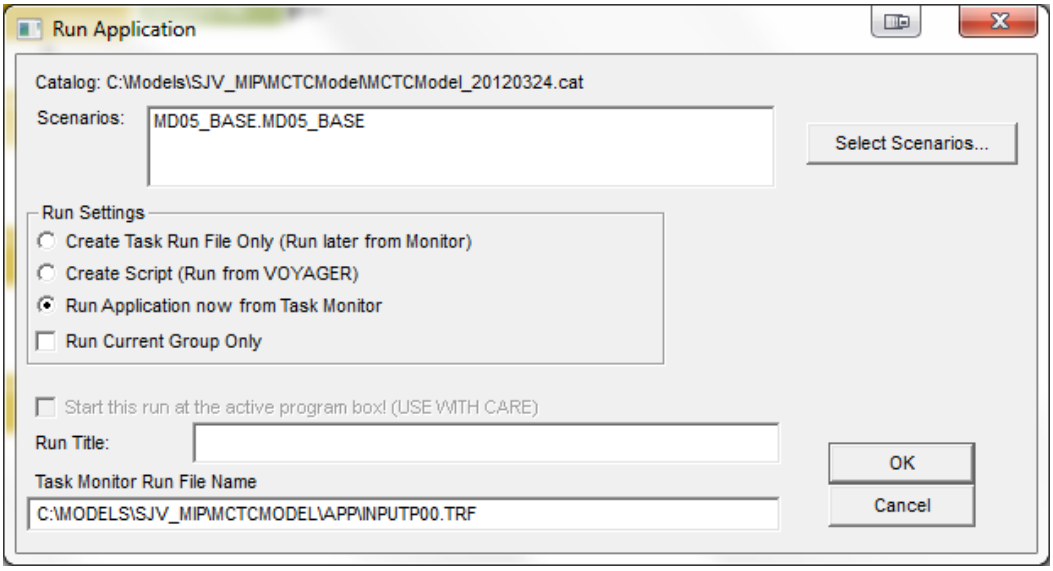
- Double-click on ***Input Processing*** in the App Pane. This will bring up the Input Processing application flow diagram in the Catalog window.



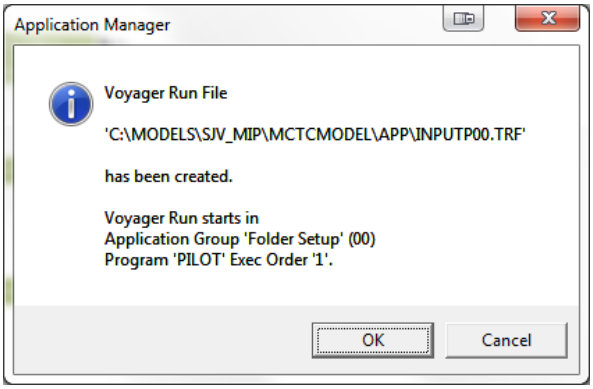
- Click on the ***Run…*** button located on the top ***Home*** ribbon. This will open the Run Application window.



- Select ***Run Application now from Task Monitor*** from the Run Settings list.



- Click ***Ok***. This should activate the Application Manager window.

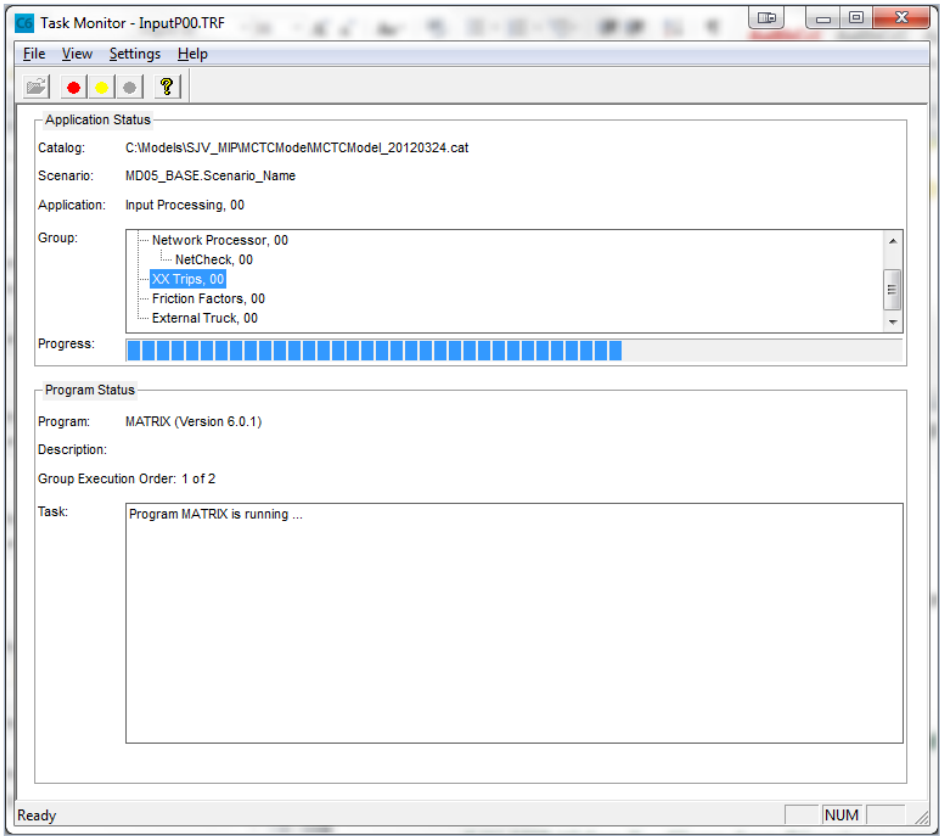


- Click ***Ok***. This should activate the Task Monitor window.

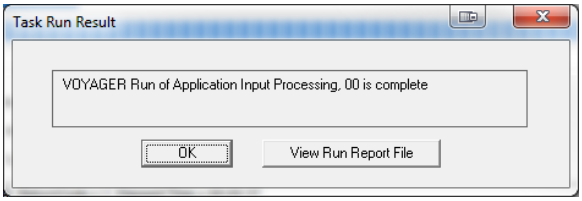
Checking Results of Input Processing

The Input Processing application creates directories, copies files, and processes input data. Reviewing key outputs of the Input Processing before running the full model is recommended to ensure that the model

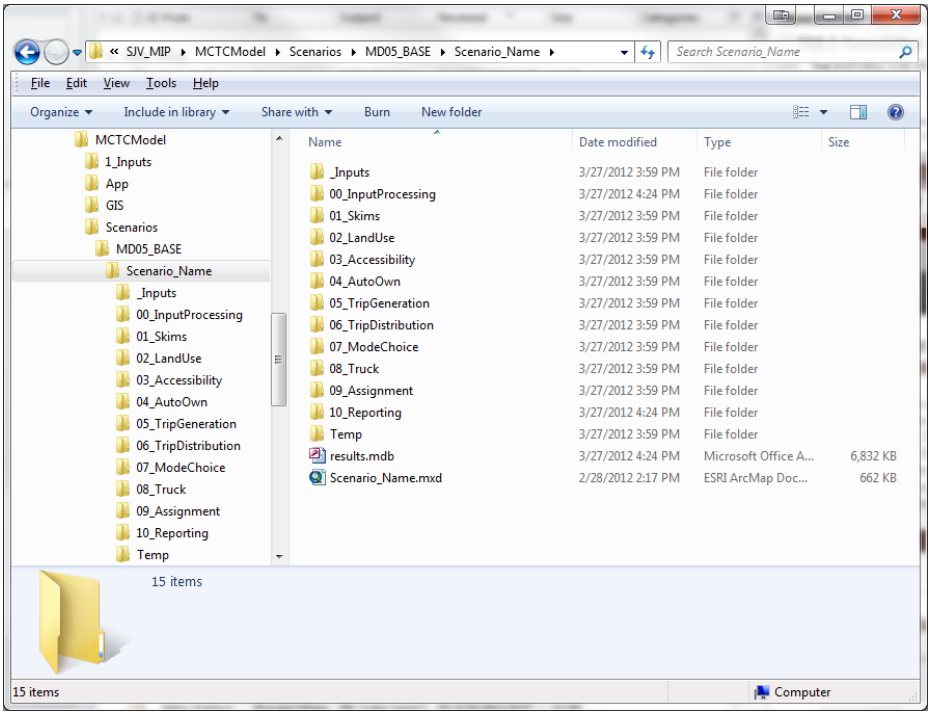
scenario being evaluated has the inputs as desired. In addition to checking that the files represent the scenario, the Input Processing also produces valuable information for scenario comparison.



- Once the run has completed successfully, the Task Run Result window will pop-up. Click ***OK***. If you would like to view the report file, click ***View Run Report File***.



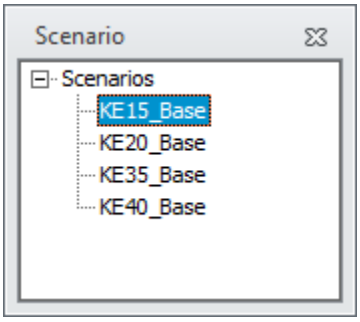
- Close the Inputs window.
- Check to see that the input files and folders were created in the appropriate model folder.



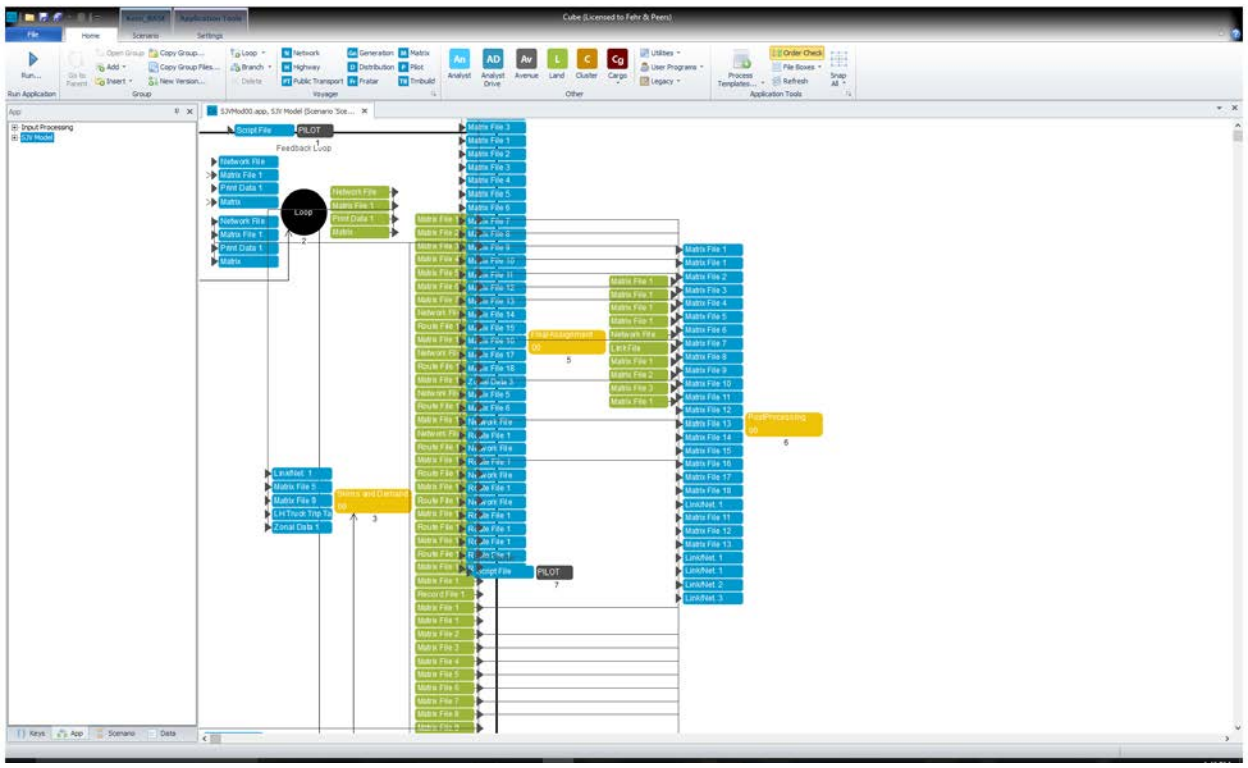
FULL MODEL RUN

Before running a full model run, verify that you have the appropriate input files created from the Input Processing application.

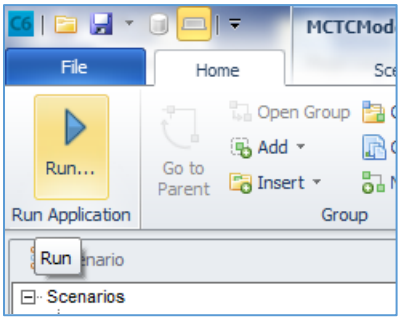
- Select the scenario you will run in the Scenario Pane.



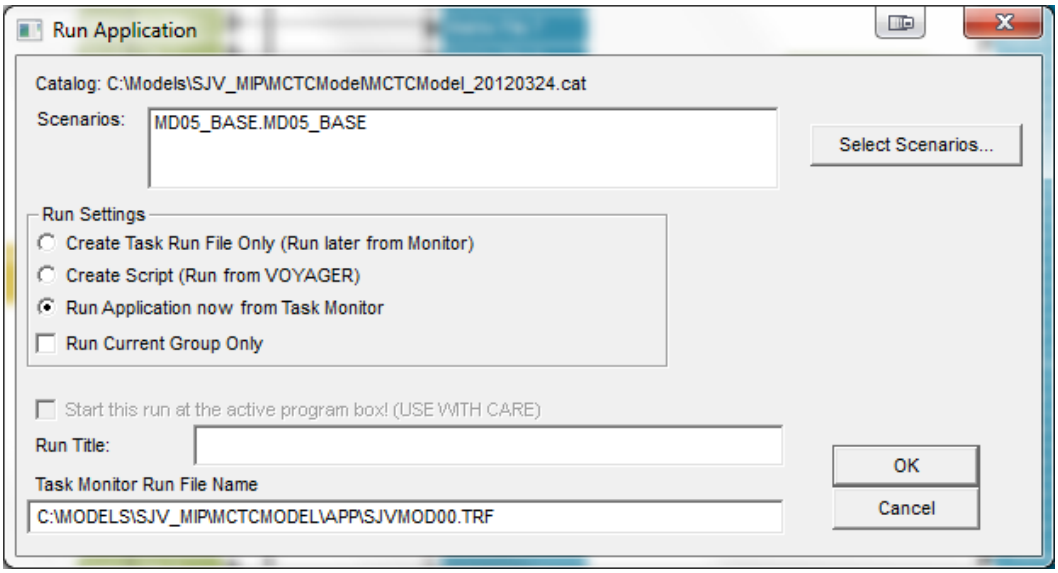
- Double-click on ***SJV Model*** in the App Pane. This will bring up the SJV Model application flow diagram in the Catalog window.



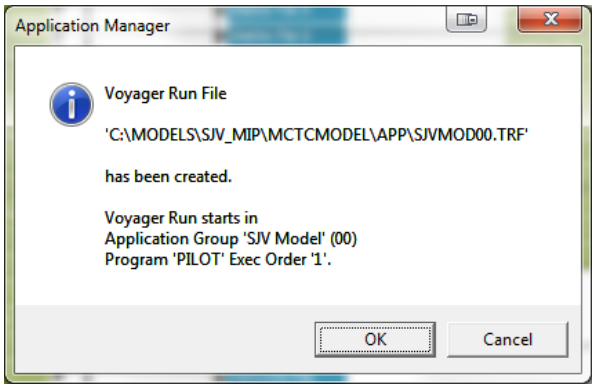
- Click on the ***Run…*** button located on the top ***Home*** ribbon. This will open the Run Application window.



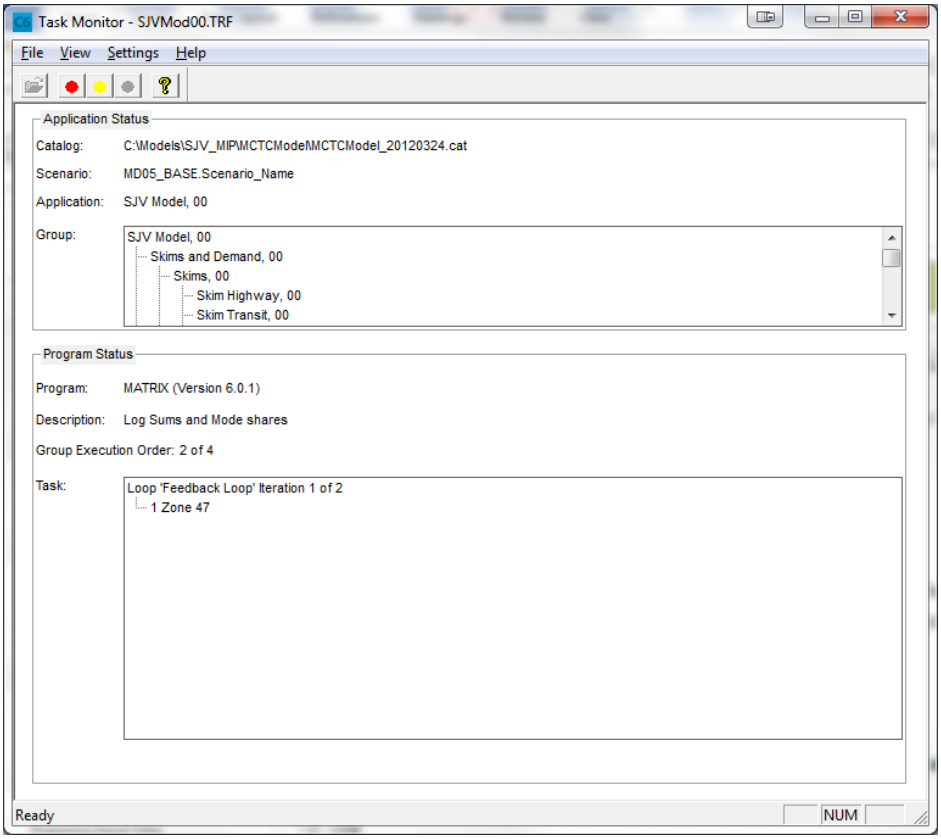
- Select ***Run Application now from Task Monitor*** from the Run Settings list.



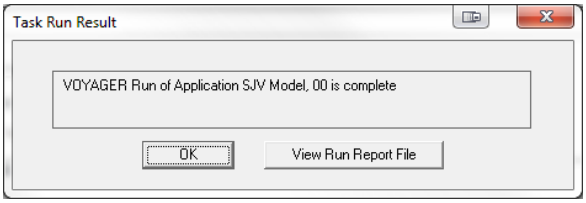
- Click ***Ok***. This should activate the Application Manager window.



- Click ***Ok***. This should activate the Task Monitor window.



- Once the run has completed successfully, the Task Run Result window will pop-up. Click ***OK***. If you would like to view the report file, click ***View Run Report File***.

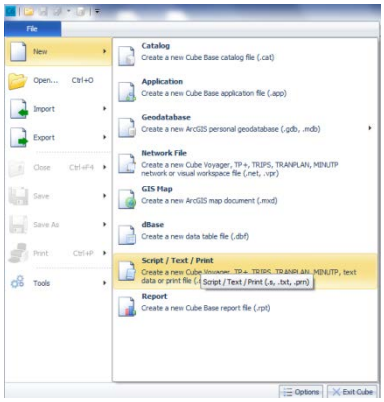


- Close the Inputs window.

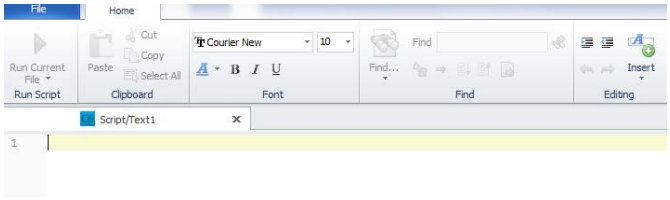
Create sample scripts using Templates

The instructions below demonstrate how to find and implement template scripts using Cube. The scripts can be implemented as is, modified, saved, or used as example syntax.

1. Create a new empty script or text file where the template will be inserted.
    a. Open Cube and then click on File -> New -> Scripe/Text/Print

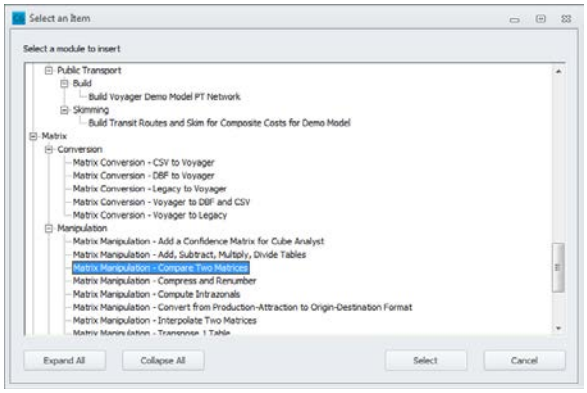


    b. A new blank script file will be opened and the context menu in Cube will change.



2. Open the Insert Script options and determine the appropriate script

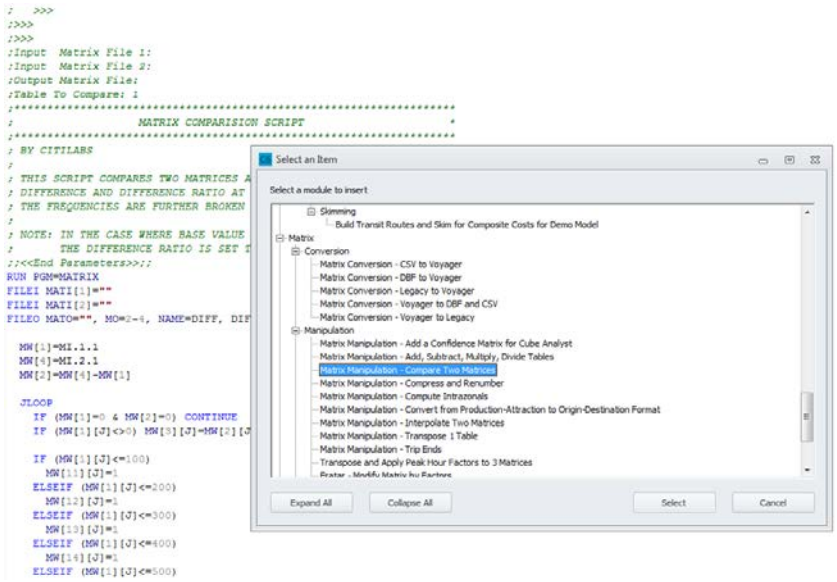
    a. Click on Insert-> Module/Template
    b. A new box organized by function will appear. Read the description and Select the template that best fits the needs of your script. In this example, compare two matrices.



c. A dialog box for input files and parameters will open. In this example, input matrix 1, input matrix 2, output matrix name, and table number to compare.

d. Enter the values by typing or browsing as needed and click Done

e. The script will be inserted into the text file. Cancel to close, or select and insert another template.



f. The syntax of the script with comments can be modified as needed. The example script calculates the difference, the ratio, and the base value only for zones that are not 0 in both cases. This could be changed to either (using the | to represent ‘or’ instead of & representing ‘and’). The example also creates a frequency distribution of difference and difference ratio in 100 unit zone ranges.

Three County Model Parameter Summary

Scenario Information				
Prefix	THCM_08_Base	THCM_05	THCM_20	THCM_35
Scenario Name	Base	Base	Base	Base
Land Use Year	2008	2005	2020	2035
Network Year	2008	2005	2020	2035
Date Updated	1/18/2012	1/18/2012	1/18/2012	1/18/2012
Updated By	SM	SM	SM	SM
Parameters				
TAZ Data	X	X	X	X
Special Generators	X	2008	2008	2008
Gateways	X	X	X	X
SE_Detail	X	X	X	X
CrossClass_TripRates	X	X	X	X
Friction Factors	X	2008	2008	2008
AutoOwnParam	X	2008	2008	2008
AutoOpCost	X	2008	2008	2008
ModeChoice	X	2008	2008	2008
Transit XY	X	2008	2008	2008
Non-highway transit links	X	2008	2008	2008
Diurnal Factors	X	2008	2008	2008
Traffic_Assignment	X	2008	2008	2008
Turn Pen	X	X	X	X
Through Trips	X	X	X	X
LOS_FDOT	X	2008	2008	2008
Trucks	X	2008	2008	2008

Constants (only list those changed from defaults, assumed for all scenarios)			
Constant	**Initial Value**	**Updated Value**	**Notes**

THCM_40	
Base	
2040	
2040	
1/18/2012	
SM	
	Notes
X	
2008	No info for other years
X	
X	
X	
2008	Universal values, using those exported from 2008 PW
2008	Universal values, using those exported from 2008 PW
2008	Universal values, using those exported from 2008 PW
2008	Universal values, using those exported from 2008 PW
2008	Rail
2008	Rail
2008	
2008	
X	Input files are scenario-specific, but all have same values
X	
2008	Universal values, using those exported from 2008 PW
2008	Truck process in development, no future year data yet

This tab contains path and filenan
Folders will be created if they do r

Tab
TAZ Data
Special Generators
Gateways
SE_Detail
CrossClass_TripRates
CrossClass_TripRates_Trucks
Friction Factors
Auto Ownership Parameters
Auto Operating Costs
Mode Choice Parameters
Non-highway transit nodes
Non-highway transit links
Smart Growth Parameters
Diurnal Factors
Traffic Assignment Parameters
Turn Penalties
Through Trips
LOS_FDOT

ne information for the export process of data preparation.
not exist.

Path and Filename
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\1_TAZ\TCM08_Base_TAZ
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\2_SEData\TCM08_Base_
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\2_SEData\TCM08_Base_
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\2_SEData\TCM08_Base_
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\6_Static\TCM08_Base_Cr
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\6_Static\TCM08_Base_Cr
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\6_Static\TCM08_Base_FF
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\6_Static\TCM08_Base_Au
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\6_Static\TCM08_Base_Au
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\6_Static\TCM08_Base_Mo
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\4_Transit\TCM08_Base_N
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\4_Transit\TCM08_Base_N
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\4_Transit\TCM08_Base_S
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\6_Static\TCM08_Base_Di
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\6_Static\TCM08_Base_Tr
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\3_Highway\TCM08_Base_
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\5_External\TCM08_Base_
D:\TDF_Working_Models\WC13-3002_SJCOG_Transporation_Model_Support\1_Inputs\6_Static\TCM08_Base_LC

	Checked	Checked by	Date
Individual Export			
ZData.csv			
SpecialGenerators.csv			
Gateways.csv			
SE_Detail_022813.csv			
ossClass_TripRates_032813.csv			
ossClass_TripRates_Trucks.csv			
Param_070512.csv			
utoOwnParam.csv			
utoOperatingCost.csv			
odeChoiceParam.csv			
lonHighwayPTNodes.csv			
lonHighwayPTLinks.csv			
martGrowthParam_NoReduction.csv			
urnalFactors.csv			
affic_Assignment.csv			
_TurnPen.csv			
_Through_Trips.csv			
DS_FDOT.csv			

TABLE J-1:
DRAFT SUMMARY OF MODEL PERFORMANCE – STATIC VALIDATION

Model Component	Validation Statistic	Evaluation Criterion	Source	Notes, further guidance[1]	Documentation
Static Validation					
Transit Assignment	1. Difference between actual ridership to model results for entire system	+/- 20%	2010 RTP Guidelines Daily	Source of actual daily ridership: http://www.ntdprogram.gov/ntdprogram/archives.htm (National transit database for base year, typically 2008) 2010 RTP Guidelines specify difference between actual ridership to model results for a given year by route group (i.e., Local Bus, Express Bus, etc.). However, National transit database only specifies transit ridership for entire system. Valley Transit operators do not use consistent route groups.	Table
Traffic Assignment	2. % of Links within Caltrans Deviation Allowance	At Least 75%	2010 RTP Guidelines *Travel Forecasting Guidelines*, Caltrans, 1992	Source of traffic data: Vehicle count database for each County for comparison Daily, non directional	Table, Figure of location and deviation color (valid, +1, +2, -1, -2). Graph (model validation scatter plot).
	3. % of Screenlines within Caltrans Deviation Allowance	100%	2010 RTP Guidelines *Travel Forecasting Guidelines*, Caltrans, 1992	Daily, non directional	Table
	4. Correlation Coefficient	At Least 0.88	3.2010 RTP Guidelines *Travel Forecasting Guidelines*, Caltrans, 1992	Daily, non directional	Table
	5. Percent Root Mean Squared Error (RMSE) (model-wide)	Below 40%	2010 RTP Guidelines	Daily, non directional	Table

[1] Potential solutions to unexpected results will vary-: TMIP Guidelines are the standard reference for troubleshooting and solutions: http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/FHWA-HEP-10-042/FHWA-HEP-10-042.pdf

TABLE J-1:
DRAFT SUMMARY OF MODEL PERFORMANCE – STATIC VALIDATION

Model	Validation Statistic	Evaluation Criterion	Source	Notes, further guidance[1]	Documentation
	6. Percent Root Mean Squared Error (RMSE) (functional classification)	Below 40%		No specific criteria available Daily, non directional Functional Class: Freeway Highway Expressway Arterial Collector	Table
	7. Percent Root Mean Squared Error (RMSE) (volume range)	0-4,999 – <116% 5,000 to 9,999 – <43% 10,000 to 19,999 – <28% 20,000 to 39,999 – < 25% 40,000 to 59,000 – < 30% 60,000 to 89,999 – <-19%	Harvey, G., et al. A Manual of Regional Transportation Modeling Practice for Air Quality Analysis for the Natural Association of Regional Councils, Washington, D.C. July 1993	Is there a minimum number of counts in a volume range or functional class range that we want to consider?	Table
	8. Model Volume to Count Ratio (model-wide)	General relationship (i.e., high or low) between model volumes and counts	2010 RTP Guidelines	Daily, non directional *Minimum Travel Demand Model Calibration and Validation Guidelines for State of Tennessee*. FHWA - identifies that model volumes should be within 5-10% of observed traffic volumes on the highway network. This is the range reference in TMIP, *Model Validation and Reasonableness Checking Manual*, 1997 for screenlines	Table
	9. Model Volume to Count Ratio (roadway functional classification)	Freeway – +/- 7% Major Arterial – 10% Minor Arterial – 15% Collector – 25%	TMIP, *Model Validation and Reasonableness Checking Manual*, 1997	Daily, non directional Percent difference targets for daily traffic volumes by facility type.	Table
	XX. Distribution of Class by Time of Day	Comparison to collected count data		Total vehicles trips stratified by class and time of day.	Table

TABLE J-1:
DRAFT SUMMARY OF MODEL PERFORMANCE – STATIC VALIDATION

Model	Validation Statistic	Evaluation Criterion	Source	Notes, further guidance[1]	Documentation
	XX. .Distribution of Time of Day by Class	Comparison to collected count data		Total vehicles trips stratified by time of day and class.	Table
	10. Model Volume to Count Ratio (volume range)	<1,000 < 60% 1,000-2,500 < 47% 2,500-5,000 – <36% 5,000-10,000 – <29% 10,000-25,000 – <25% 25,000-50,000 – <22% >50,000 – <21%	TMIP, *Model Validation and Reasonableness Checking Manual*, 1997	Percent difference targets for daily traffic volumes for individual links.	Table
Reasonableness Checks					
Highway and Transit Networks	11. General roadway network and transit line coding	Reasonableness Check	TDF Model	Centerline	
Trip Generation	12. PA Balance	+/- 10% by purpose and overall	TDF Model	after including IX/XI trips	Table or bar chart comparing balance before and after adjustment
Trip Distribution	13. Zonal Trip Distribution		TDF Model	Select link assignment for gateways, TAZ near gateway, and TAZ central to model network.	Network bandwidth plots.
Vehicle Availability	14.		2010 ACS (Surveys from 2006-2010) and CAHHTS http://www.dot.ca.gov/hq/tsip/tab/documents/travelsurveys/Final2001_StwTravelSurveyWkdayRpt.pdf	County level comparison Compare percent of households (single and multiple) with 0, 1, 2, 3+ autos CAHHTS includes survey data for Fresno, Kern, Merced, San Joaquin, Stanislaus, and Tulare counties. (Table 4, Pages 26 – 30)	

TABLE J-1:
DRAFT SUMMARY OF MODEL PERFORMANCE – STATIC VALIDATION

Model	Validation Statistic	Evaluation Criterion	Source	Notes, further guidance[1]	Documentation
Feedback Loop	15.			Convergence	
Comparisons					
Land Use	16. Total Population	Within 3% (based on RHNA criteria)	Census	by income group	Bar chart comparing model to census data.
	17. Total Households	Ideally within 3% (RHNA criteria)	Census or Department of Finance	RHNA allocations are not anticipated until mid 2013	Bar chart comparing model to census data.
	18. Total Employment	Note	Department of Finance	Check reasonableness of retail jobs per household and non-retail jobs per household. Job mix?	Bar chart comparing model to census data.
Trip Generation	19. Person trip rates		CAHHTS, ITE	Convert person trip rates to ITE rates using Ave Veh Occ by purpose	Table
	20. Average Trip Length by Purpose		CAHHTS	3-County model also has OD survey	Table
Trip Distribution	21. Trip Length Frequency Distribution by Purpose		CAHHTS	3-County model also has OD survey	Graph for each purpose
	22. Vehicle class		Count data	Percent by class for each period Percent by time period for each class	Table
Trip Assignment	23. VMT	+/- 5%	HPMS http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary	Compare countywide daily VMT estimate from HPMS (Table 10, Page 80) Reasonableness of comparison should be based on how the model compares to HMPS estimates. In general, The model should be VMT forecasts should be lower than the HPMS estimate, since HPMS VMT is estimated for local streets that are not in the model networks.	Table

TABLE J-1:
DRAFT SUMMARY OF MODEL PERFORMANCE – STATIC VALIDATION

Model	Validation Statistic	Evaluation Criterion	Source	Notes, further guidance[1]	Documentation
	24. Travel Speed by Functional Classification		Existing Data	Compare by functional classification based on observed data. For all classifications, summarize average speed, minimum, and maximum. If observed data is not available, compare relative congested speed by functional class.	Table
	25. Average Travel Time by Trip Purpose		CAHHTS	Daily CAHHTS provide travel time for HBW trips and total trips. http://www.dot.ca.gov/hq/tsip/tab/documents/travelsurveys/Final2001_StwTravelSurveyWkdayRpt.pdf	Table
Mode Split	26. Mode split by purpose		CAHHTS	Daily	Pie chart

Notes: All MPO models will be evaluated based on the criteria above and based on their classification in the 2010 RTP Guidelines will be evaluated by Complies/Not Required, Partly Complies, Does Not Comply.
Source: Fehr & Peers, 2011

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Dynamic Validation						
Land Use (1)	1. Add 10, 100, 1,000, 5000, and 10,000 Households to a residential-only TAZ without changing mix of HH categories.	Consistent person trip rate and vehicle trip rate with each increment of added HH. The selected TAZ should be able to accommodate additional land use without changing density. Two test locations: (1) near urban core and (2) a rural location. Person trip generation should be consistent, VMT per HH/Employee should be lower for TAZ near urban core and SOV share should decrease. Daily Analysis	Table comparing the following for each incremental change: • Vehicle Trips (VT) • Change in VT per land use unit change • Vehicle miles traveled (VMT) • Change in VMT per land use unit change • Vehicle hours traveled (VHT) • Change in VHT per land use unit change • VMT per VT Bar charts comparing person trip generation rate and vehicle trip generation rate for each increment of land use change. Bar charts could be combined with jobs tests.	Intent of rural vs. urban core is to test model sensitivity to destination proximity (As recommended in (RTP Guidelines p.55, point 2a)	X	

[1] Intent of rural vs. urban core is to test model sensitivity to destination proximity (p.55, point 2a)

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Land Use (2)	2. Add 10, 100, 1,000, 5000, and 10,000 Jobs to an employment-only TAZ without changing mix of employment categories Daily Analysis	Consistent person trip rate and vehicle trip rate with each test. The selected TAZ should be able to accommodate added land use without changing density. Test location near urban core and remote location. VMT per HH/EMP should be lower for TAZ near urban core and SOV share should decrease.	• Table comparing the following for each incremental change: • Vehicle Trips (VT) • Change in VT per land use unit change • Vehicle miles traveled (VMT) • Change in VMT per land use unit changeVehicle hours traveled (VHT) • Change in VHT per land use unit change • VMT per VT Bar charts comparing person trip generation rate and vehicle trip generation rate for each increment of land use change. Bar charts could be combined with household tests.		X	X

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Assignment (1)	3. Add Lanes to a Link	Select two locations in a major urban center. One location should be a major street across a constraint (railroad track, river, or freeway). The other location should be a minor street. Increased volume on subject link. Parallel facility should show similar magnitude decrease in volume. Screenline should show slight increase. The influence area should be greater for the major street compared to the minor street. In both cases, changes should be concentrated near the subject link. Peak hour analysis Full model run (no peak period, off-peak period, or transit assignment)	Graph comparing volume change for screenline facilities. Network screen capture showing volume change using. Use bandwidth to illustrate magnitude of change and color to distinguish increase or decrease.		X	

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Assignment (2)	4. Add/delete a Link	Select two locations in a major urban center. One location should be a major street across a constraint (railroad track, river, or freeway). The other location should be a minor street. For add-link test, expect increased volume on subject link. Parallel facility should show similar magnitude decrease in volume. Screenline should show slight increase. For delete-link test, expect decreased volume on subject link. Parallel facility should show similar magnitude increase in volume. Screenline should show slight decrease. The influence area should be greater for the major street compared to the minor street. In both cases, changes should be concentrated near the subject link. Peak hour analysis Full model run(no peak period, off-peak period, or transit assignment)	Graph comparing volume change for screenline facilities. Network screen capture showing volume change using. Use bandwidth to illustrate magnitude of change and color to distinguish increase or decrease.		X	

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Assignment (4)	5. Change Link Speeds	Select one location in a major urban center, a major street across a constraint (railroad track, river, or freeway) that has a defined screenline developed with subject link and adjacent roadways. Increase and decrease posted speeds by +/- 10 mph on subject facility. As posted speed is decreased, volume on selected link should decrease and volume on adjacent screenline links should increase. As posted speed is increased, volume on selected link should increase and volume on adjacent screenline links should decrease. The influence area should be concentrated near the subject link. Peak hour analysis Full model run(no peak period, off-peak period, or transit assignment)	Table comparing the following for the selected screenline for speed increase and speed decrease: • Roadway • Posted speed • Adjusted speed • Volume change Network screen capture showing volume change using. Use bandwidth to illustrate magnitude of change and color to distinguish increase or decrease. May need to post volume change depending on the magnitude of change.		X	

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
	6. Change Link Capacities	Select one location in a major urban center, a major street across a constraint (railroad track, river, or freeway) that has a defined screenline developed with subject link and adjacent roadways. Capacity added, increased volume on subject link. Parallel facility should show similar magnitude decrease in volume. Screenline should show slight volume increase. Where capacity removed, decreased volume on subject link. Parallel facility should show similar magnitude increase in volume. Screenline should show slight volume decrease. The influence area should be concentrated near the subject link. Peak hour analysis Full model run	Graph comparing volume change for screenline facilities. Network screen capture showing volume change using. Use bandwidth to illustrate magnitude of change and color to distinguish increase or decrease.		X	

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Transit Network (1)	7. Increase/Decrease Transit Fares	Doubling and halving system-wide fares. System-wide ridership should increase/decrease. The model should respond in the range of elasticity from the Traveler's Response Handbook, which provides an absolute elasticity range of -0.14 to -0.35. Full model run(no auto assignment except within feedback loop)	Table comparing daily system ridership before and after fare change.		X	
Transit Network (2)	8. Increase Transit Speeds	Doubling and halving system-wide transit speed. The modeled ridership should respond in the range of elasticity form identified in the Traveler's Response Handbook, which provides an absolute elasticity range of 0.3 to 1.0. Full model run(no auto assignment except within feedback loop)	Table comparing daily system ridership before and after fare change.		X	
Transit Network (3)	9. Transit Network	Increase/Decrease Transit Headway	Doubling and halving system-wide transit headway. The model should respond in the range of elasticity form identified in the Traveler's Response Handbook, which provides an absolute elasticity range of -0.3 to -1.0. Full model run(no auto assignment except within feedback loop)	Table comparing ridership before and after headway changes. Bar charts comparing same information.	Although RTP Guidelines mention changing transit speed, changes to headways are a more feasible policy change	

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Travel Cost	10. Increase/Decrease Toll Rates	1) Increase tolls model-wide Vehicle trips should decrease systemwide (other modes increase). 2) Select one location in a major urban center, a major street across a constraint (railroad track, river, or freeway) that has a defined screenline developed with subject link and adjacent roadways. Toll decreased, decreased volume on subject link. Parallel facility should show similar magnitude increase in volume. Screenline should show slight volume decrease. The influence area should be concentrated near the subject link. Peak hour analysis Full model run (no peak period, off-peak period, or transit assignment)	Graph comparing volume change for screenline facilities. Network screen capture showing volume change using. Use bandwidth to illustrate magnitude of change and color to distinguish increase or decrease.		X	

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Induced/Suppressed Demand Tests	11. Double/Halve Roadway Capacity of Model Subarea	Double and halve roadway capacity and double number of lanes in a major urban center. Percent change in VMT should decrease as capacity is halved and increase as capacity and number of travel lanes are doubled. Calculate short-term elasticity and compare to literature. Cervero short-term elasticity = 0.20-0.50. AM peak period PM peak period Daily	For sub-area test, provide network screen capture showing volume change using. Use bandwidth to illustrate magnitude of change and color to distinguish increase or decrease. Provide table with the following information: • Percent change in lane miles • VMT • Percent change in VMT • Calculated elasticity • Published elasticity • Average trip distance by purpose		X	

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Auto Availability and Auto Trip Variables	12. Double Auto Operating Cost, Parking Cost, and Transit Frequency.	For a major urban center, double auto operating cost, parking cost, and transit frequency. Summarize change in vehicle trips, transit person trips, and walk/bike person trips. Increased auto operating and parking cost should result in lower vehicle ownership and trips. Transit, walk, and bike person trips should increase. Increased transit frequency should result in decreased vehicle availability and vehicle trips. Transit person trips and walk and bike person trips should increase. Compare to literature, SACOG and Travelers Response Handbook. Observed elasticities vary; -0.2 is an approximate mid-point value (i.e., a 20% reduction in vehicle trips/vmt vmt for a doubling in auto operating costs.	Provide a table that summarizes the following information for each test: • Vehicle Availability/HH • Vehicle trips • Transit person trips • Walk/bike person trips • Difference • Percent change from base model Vehicle trips should be compared measured elasticity to literature.(0.2)	Sources: http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c14.pdf http://www.arb.ca.gov/cc/sb375/policies/pricing/roadpricing_brief.pdf http://www.arb.ca.gov/cc/sb375/policies/pricing/parkingpricing_brief.pdf Westside Mobility Plan Model Development Report (Fehr & Peers); includes summary of SACOC	X	

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Density (4Ds)	13. Uniform Changes in Density in All TAZs in Select Area	For a major urban center, double each land use category to maintain the existing balance of land use so that the diversity is not changed. The models vehicle trip elasticity to a 100% increase in density should be about -0.04. Daily	Provide a table that summarizes the following information for the base model and test model: • Vehicle trips • Transit trips • Walk/bike trips • Total trips • Vehicle miles traveled (VMT) • Vehicle minutes traveled • VMT/VT	First potential solution for unexpected results from this and all D-tests below: check centroid connector length/impedance.	XX	

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Diversity	14. Optimizing Land Use Mix (Diversity) of a Single Area	Create a location that has a diversity score of 1.0 and modify the employment to create a diversity score of 0.5. Diversity is calculated using the following formula: ***Change in Diversity*** *= Percent Change in {1-[ABS(b*population – employment)/(b*population+employment)]}* *Where: ABS = absolute value; b= regional employment/regional population* For the select area of a major urban center, develop a test model that retains the regional average mix while maintaining the density level in the area to isolate the model's sensitivity to diversity. A sensitive model should internalize a greater percentage of trips compared to an area that does not have a diverse land use mix. Based on the 4D elasticity values, a 100 percent increase in overall diversity should result in a 6 percent reduction in vehicle trips (a -0.06 elasticity. Daily	Provide a table that summarizes the following information for the base model and test model: • Vehicle trips • Population • Households • Jobs • Employment-to-population ratio • Internal trips • External trips • Internal trips as a percent of total trips Change if internal and external trips (test model – base model)	First Potential Solution – check centroid connector length/impedance.	X	

TABLE K-1:
SUMMARY GUIDE TO TESTS OF DYNAMIC MODEL PERFORMANCE

Model Component	Test	Expectation	Output	Notes, further guidance	Priority	
					Recommended by CTC 2010 RTP Guidelines[1]	Desirable Optional
Urban Design/Walk		Models presumed to be insensitive		Will be modeled via BMP tool; adjusted trip table assigned by model		
Travel Demand Management		Models presumed to be insensitive to most employment-site TDM		Will be modeled via BMP tool; adjusted trip table assigned by model (work-related trips only)		

Source: Fehr & Peers, 2011

Roadway Networks

Highway network variables and values are listed below.

Highway Facility Type (FACTYP)
1. Freeway
2. Highway
3. Expressway
4. Arterial
5. Collector
6. Local
7. Ramp: Freeway-Freeway
8. Ramp: Slip
9. Ramp: Loop
10. Connector: Dist. ≤ 0.25
11. Connector: Dist. > 0.25

Master network variables

Attribute	Description
Nodes	
X	X-coordinate of node in Nad 83
Y	Y-coordinate of node in Nad 83
N	Node number
TAZ	Traffic Analysis Zone Number
DISTRICT	Super district number used for aggregation
SOI	Sphere of influence used to number TAZs alphabetically
STYINT	Study location number used to record turning movements when non-zero
COUNTY	County where node is located
JURISDICTION	Political jurisdiction where node is located
COMMUNITY	Community/district name

Attribute	Description
Links	
A	A node
B	B node
DISTANCE	Distance in miles
NAME	Local street name
ROUTE	Numerical state route number
TERRAIN	Terrain (F=Flat , R=Rolling, M=Mountain)
JURISDICTION	Political jurisdiction where link is located location
SCREENLINE	Screenline by direction (See Figures 3-1.1 through 3.1.10)
XXXX_PRJID [1]	RTP Project ID number
XXXX_PRJYR [1]	RTP Project Opening Year
XXXX_FACTYP [1]	Facility type by year [2]
XXXX_AREATYP [1]	Area type by year [2]
XXXX_LANES [1]	Number of directional through travel lanes by year [2]
XXXX_AUX [1]	Auxiliary lane (0=no, 1=yes)
XXXX_SPEED [1]	Free-flow speed in miles-per hour by year [3]
XXXX_CAPCLASS [1]	Capacity class by year (derived from Terrain, Facility type, and Area Type) [2]
XXXX_CAPACITY [1]	Vehicle per hour (calculated based on Lanes and CapClass) [4]
XXXX_USE [1]	Identifies vehicle prohibitions by year [5]
XXXX_TOLL [1]	Code used for cost on toll facilities by year [3]
AREATYP	Character to store scenario variable
AIRBASIN	Air basin number for air quality or County number in multi-county models
TSM	Transportation System Management
EJ	Environmental Justice designation (0 or 1)

Notes:
XXXX represents BASE (calibration/validation year), IMP1 (status after first improvement), and IMP2 (status after second improvement). In addition to calibration/validation year which varies by MPO, required years to be covered by improvement are 05, 20, 35, and 40.
See Tables 3.3-2 for details on CapClass by Terrain, Facility Type, and Area Type.
See Tables 3.3-3 for Speed ranges by Terrain, Facility Type, and Area Type.
See Tables 3.3-4 for details on Capacity by Terrain, Facility Type, and Area Type.
0 or 1=facility open to all (“general purpose”) ; 2=Carpool 2; 3=Carpool 3+; 4=Combination trucks prohibited; 5=Walk or bike only
Source:

Validating Input Data

A recommended practice is to check the highway network for accurate information and link connectivity before running model scenarios.

Overview of VMIP Model Input Data

Within a highway network are links and nodes that can be checked for errors.

- Links can be 'dangling' with
- Base data that do not change by scenario are located in the Master.GDB and all other scenario specific data are contained in the Results.MDB within the scenario directory.
- To make maps using different symbology or variables, refer to the documentation tables for list of variables and values.

Highway Network

Each model has a master network file called *MPO_MASTERNETWORK.NET*. The master network file contains links and nodes, which can be checked for accuracy within Cube.

The first step is to open the master network file in Cube and visually inspect the density of the network file in rural, suburban, and urban areas. Cube automatically visualizes the network links as blue and the centroid connectors as grey.

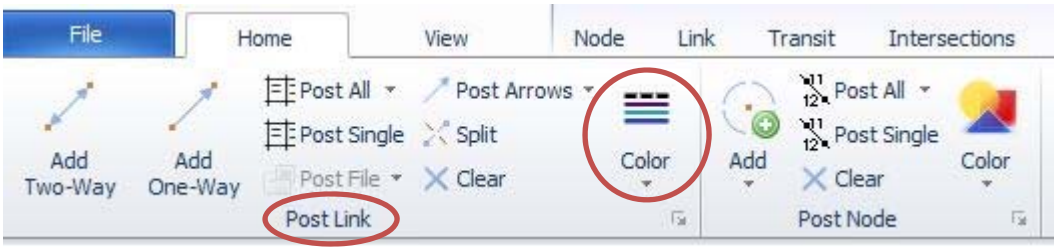
Network Links

Updating attributes

Changes to any network link attribute are described below using Facility Types as the primary example.

Facility types categorize the network according to the type of service provided by the roadway. Examples of facility types include expressways, highways, and arterials. During assignment, the facility type is used to determine link capacity and volume delay functions, and ultimately impacts total volumes assigned to the links.

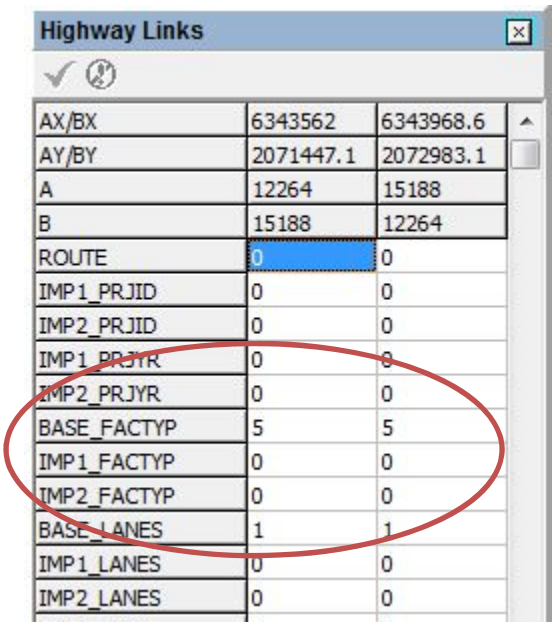
Facility types can be checked by color-coding the links with the facility type categories. This can be done under the **Home** tab**,** and clicking on **Post Link Color**.



Any errors in facility types can be fixed in two ways.

1. Fixing facility type errors manually – best for editing a few links

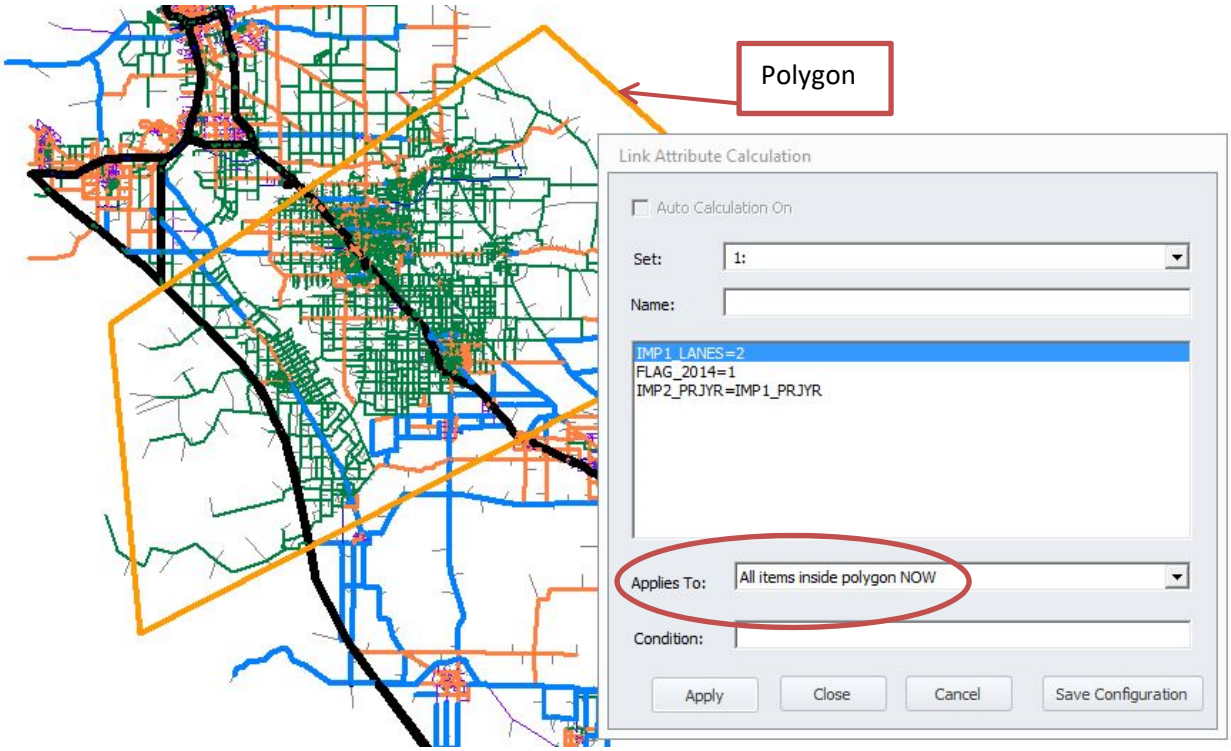
By clicking on the link, Cube opens a window with the link attributes. Located the facility type field and input the correct facility type for the base year and any improvement year facility types if applicable. Note, this is only for errors in facility types, not upgrades.



2. Fixing facility type errors by calculation – best for editing many links

Under the **Link** tab is **Compute**, in which the change to facility type is entered as an equation. This method is best used with a polygon boundary. A polygon boundary can be drawn around the incorrect links by clicking on New under the Drawing Layer Tab.

Once the polygon is drawn, the facility types can be changed using **Link, Compute** and applying changes inside/outside the polygon boundaries. Additional conditions can be added if needed.



The same process can be repeated for **speeds**, **number of lanes**, and **area type**.

Link improvement logic checks

These checks validate continuity and accuracy of the network improvements. The improvement field names in the master network file may differ from the improvement fields for each specific MPO.

1. IMP_PRJYR exists but no change in lanes #
    - IMP1_PRJYR<>0 & (BASE_LANES=IMP1_LANES) or
    - IMP2_PRJYR<>0 & (IMP1_LANES=IMP2_LANES)

2. Lanes # change but no IMP_PRJYR
    - (IMP1_LANES<>0 & (BASE_LANES<>IMP1_LANES)) & IMP1_PRJYR=0 or
    - (IMP2_LANES<>0 & (IMP1_LANES<>IMP2_LANES)) & IMP2_PRJYR=0

3. 3+ improvement links – the Standard Network Variables have been set up to track only 2 improvements.
    - BLDYEAR<>0 & IMPYEAR<>0 & DELYEAR<>0 or
    - BLDYEAR<>0 & IMPYEAR<>0 & IMPYEAR1<>0 or
    - BLDYEAR<>0 & DELYEAR<>0 & IMPYEAR1<>0 or
    - IMPYEAR<>0 & DELYEAR<>0 & IMPYEAR1<>0

4. Out-of-order years

- (IMP1_PRJYR<>0 & IMP2_PRJYR<>0) & IMP1_PRJYR>=IMP2_PRJYR

5. IMP1_PRJID and IMP2_PRJID missing on all improvement projects

SELECT LINK ANALYSIS / FRATAR TO ITE CONTROL TOTALS

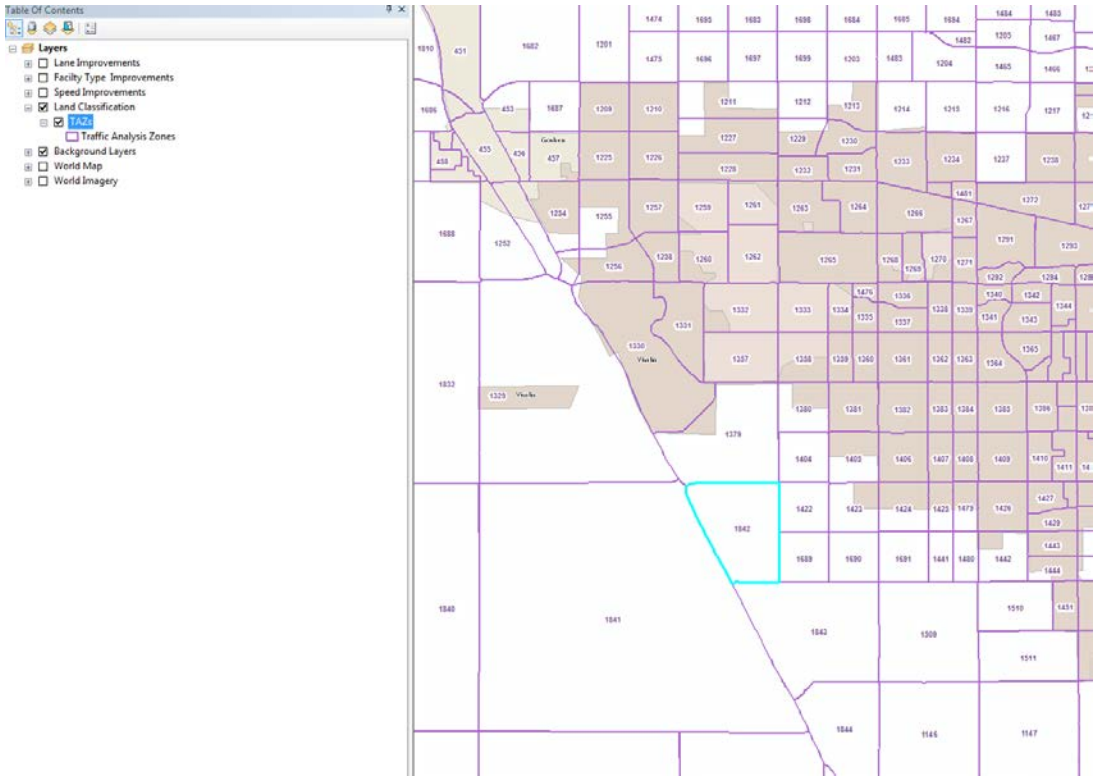
Creates select link or zone analysis for review in personal geodatabase file. If desired, select zone can be adjusted to match ITE control totals for easier review of select zone. The high level steps for this process are:

- Full model run with land use representing the project
- Prepare trip generation target and input file
- Define Scenario detail in Cube Application keys and running the post-process
- Review results

Full Model Run Preparing for Select Link/Fratar

The Select Link and Fratar post-process is based on a full model run for a given scenario and tracks the route/distribution of auto trips for a single zone or a group of zones. Before running the model, it is recommended to review the TAZ boundary to determine which zone(s) reflect the project, the land use in the zone(s), and if additional zones should be created.

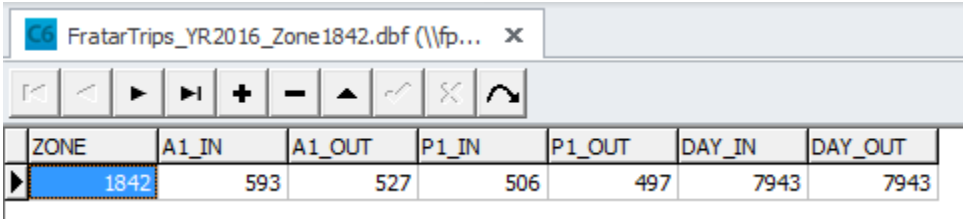
- The MODELNAME.MXD in the GIS directory contains a later for the TAZ boundary. (TAZ 1842 in the example below)



- Use the Parameters Workbook to review the land use in the zone and compare with the project land use. Typical projects fall into one of the following cases.
    - Case A: The land use is similar in type and magnitude and if the project represents the entire zone. No additional changes are needed.
    - Case B: The land use is not similar in type and magnitude, but represents the entire TAZ. Update the land use to reflect the project.
    - Case C: The land use is similar in type and magnitude, but does not represent the entire TAZ. Identify a vacant TAZ within the same zone range, modify the land use in the original zone and project zone to match the type and magnitude of land use, add a centroid and connector to the master network using the same attributes as the original zone.
    - Case D: The land use is not similar in type and magnitude and the project does not represent the entire original zone, or the entire project is in addition to the existing land use in the zone. Identify a vacant TAZ within the same zone range, leave the land use in the original zone and add the project land use to the vacant zone, add a centroid and connector to the master network using the same attributes as the original zone.

Prepare trip generation target and input file

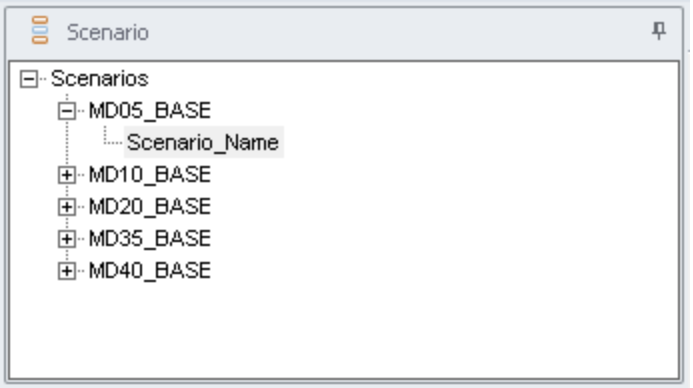
- Determine the net new project vehicle trips for AM Peak 1hr, PM Peak 1hr, and Daily using empirical data, regionally validated trip generation rates, ITE, MXD+, or other methods.
- Copy and rename the 1_Inputs_Support\Tools\FratarTrips.DBF to a project specific name, and open in Cube.
- Edit the Zone number(s) and inbound/outbound trips by time of day to reflect the project. Save the file and close.



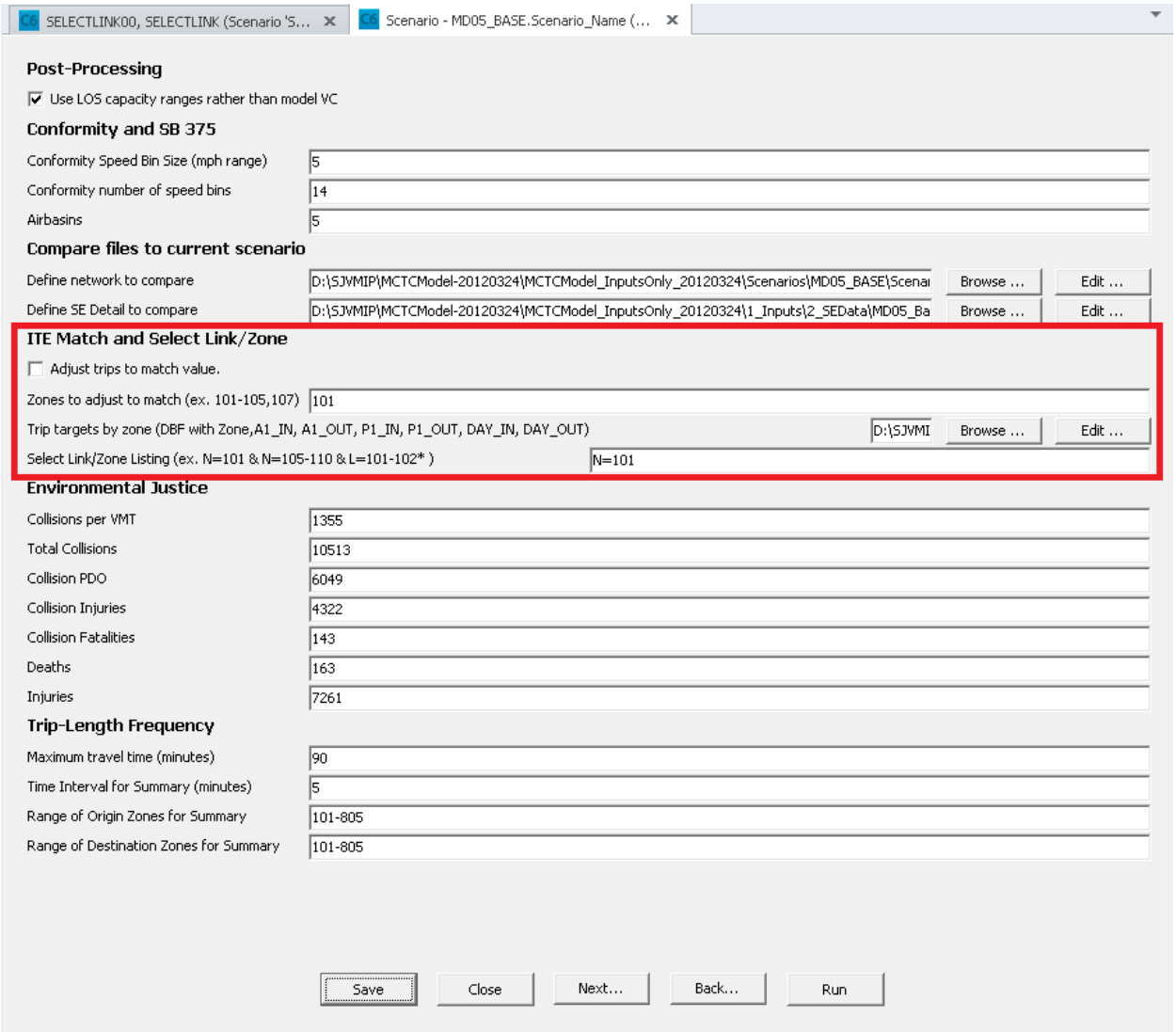
ZONE	A1_IN	A1_OUT	P1_IN	P1_OUT	DAY_IN	DAY_OUT
1842	593	527	506	497	7943	7943

Define Scenario detail in Cube Application keys and running the post-process

- Select the scenario for evaluation

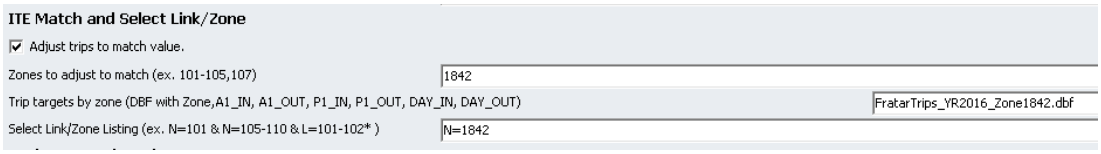


- Click ***Next*** for second page of scenario keys
- Define ITE Match and Select Link/Zone options to compare

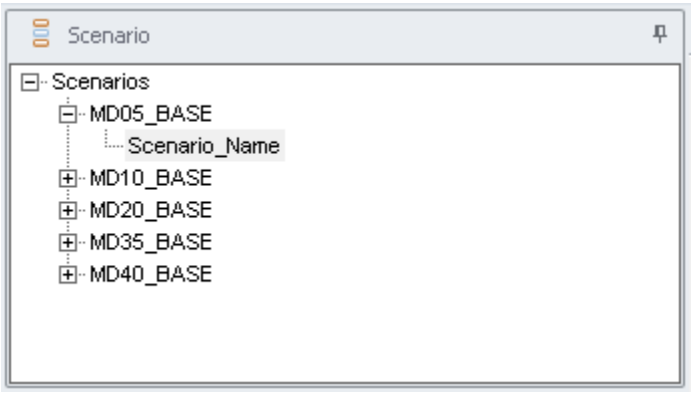


- Update the scenario key Cube Catalog for the scenario being evaluated

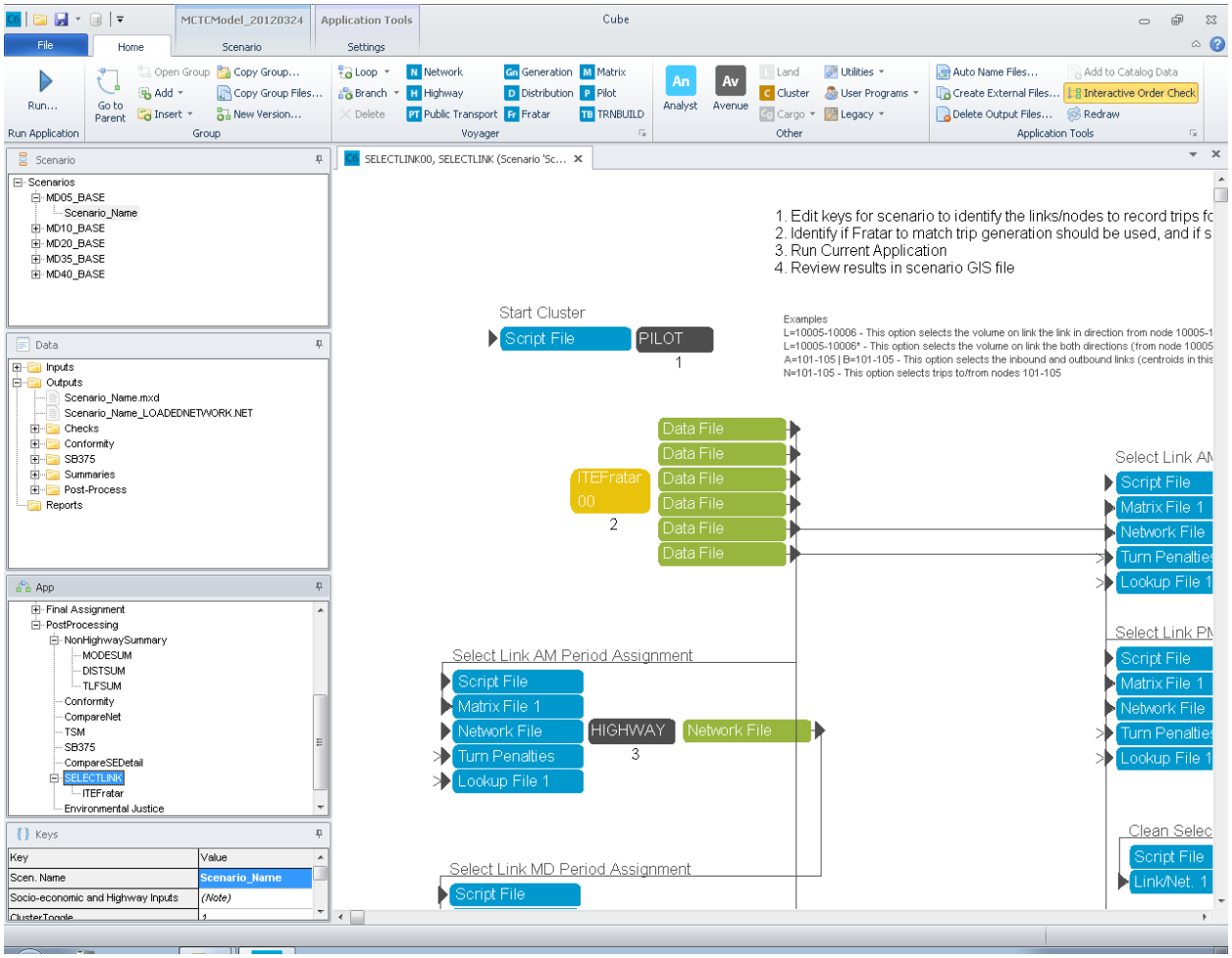
- Check “Adjust Trips to match value” for Fratar to be active
- Enter zone number(s) for Fratar trips, or leave box unchecked and zone as 101 for no change from model generated trips
- Browse to reference file created and modified to reflect the project trips for the scenario. Note that the full path should show in the box, unlike the example below which uses only the file name as an example.
- For a select zone(s), enter N= and then the zones separated by commas. For a Link, enter L=ANode-BNode. Additional example syntax in the Application image below



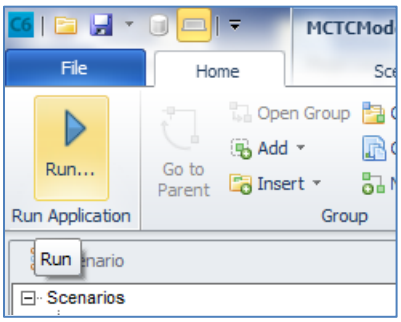
- Save and exit the scenario
- Select the scenario for evaluation



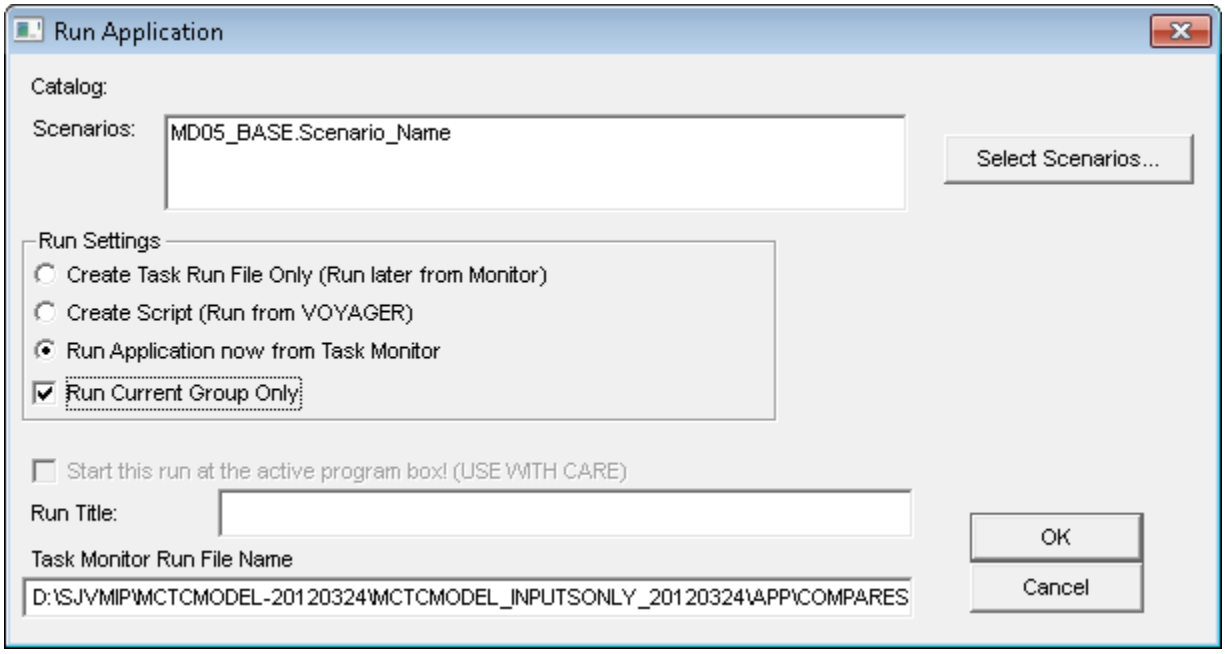
- Brows in the Applications to SelectLink



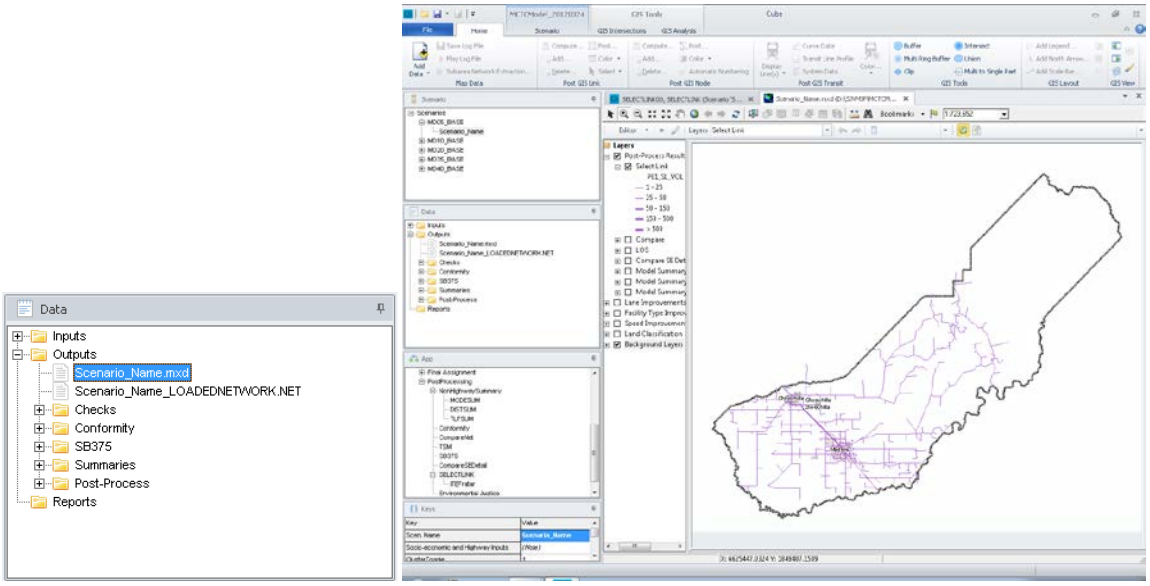
- Click on the ***Run…*** button located on the top ***Home*** ribbon. This will open the Run Application window.



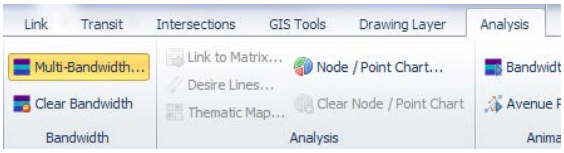
- Check the ***Run Current Group Only*** button.

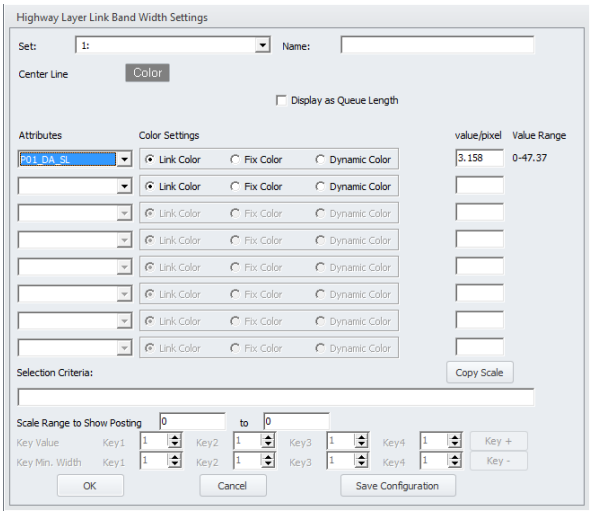


- Click ***OK*** and proceed with model run.
- To view results double click on the personal geodatabase in the Data pane

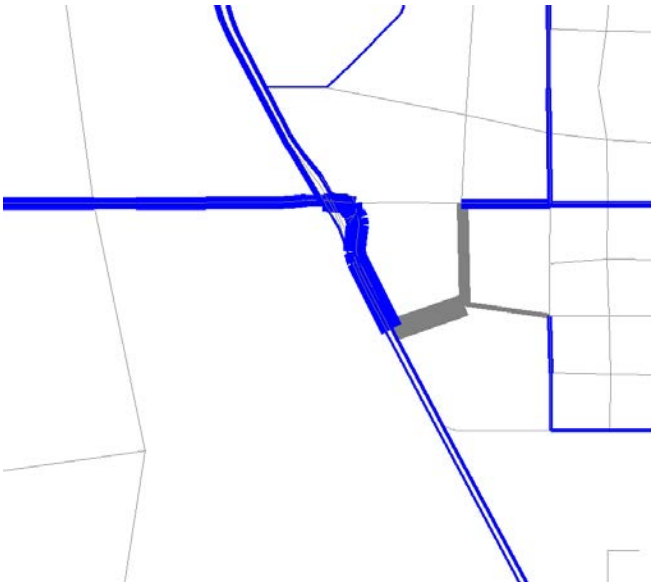


- To view results on the Cube Network, open 09_Assignment\SCENARIO_SL_LinkVolumes.NET

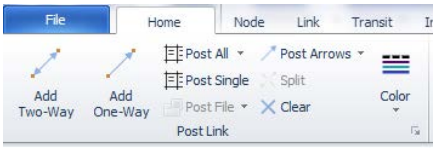


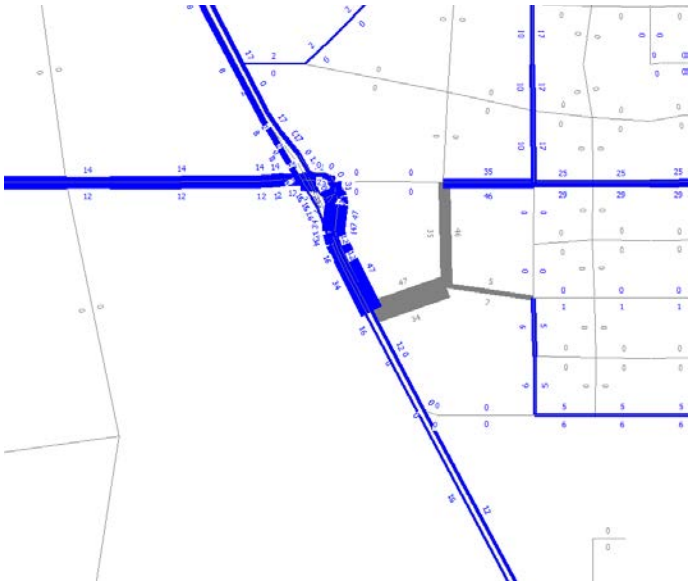


- The variables can be posted using multi-bandwidth and/or labels and use the same naming convention as the full assignment, with the exception that project trip variables include _SL at the end. For example, P01_DA_SL is the PM peak 1hr (P01) Drive Alone (DA) select link (SL).
- For multi-bandwidth, select Analysis and then Multi-Bandwidth, and one or more variables to be posted. Click ok and zoom to the study zone(s) to view the results.

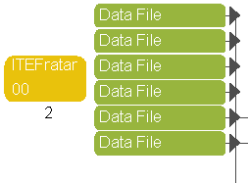


- Next, to post the values, select Home and then Post All in the Link section, and one or more variables to be posted. Click ok and zoom to the study zone(s) to view the results.

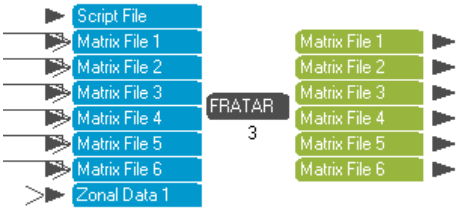




- Percentage of project trip distributions can be calculated using the Link Calculation functions, as needed.
- If the result are not matching the target, verify that the Catalog Keys and the input file are correct. The ITEFratar step applies the targets to the AM 1hr, PM 1hr, and proportional to the times of day that add to create daily.



  - Review the inputs (FRATARIN is the original and SL is the output) and outputs of this step to confirm the results match what is expected for the row and column totals.
  - The auto trips (drive alone, shared ride 2, and shared ride 3+) and truck trips are all adjusted based on the land use trip generation. Only XX trips are not adjusted.



  - The example below, the AM 1hr row total (outbound) and column total (inbound) for the original matrix file (left) was adjusted to match the target values, as shown on the output matrix file (right).
  - Although comparing each mode is possible, the total on the first tab for each time period is the most effective in QA since mode share by zone may vary and quickly determining if the trips match by mode is more difficult than total vehicles.

TU17_DOF_VEHTRIPS_AM1_FRATIN.mat...

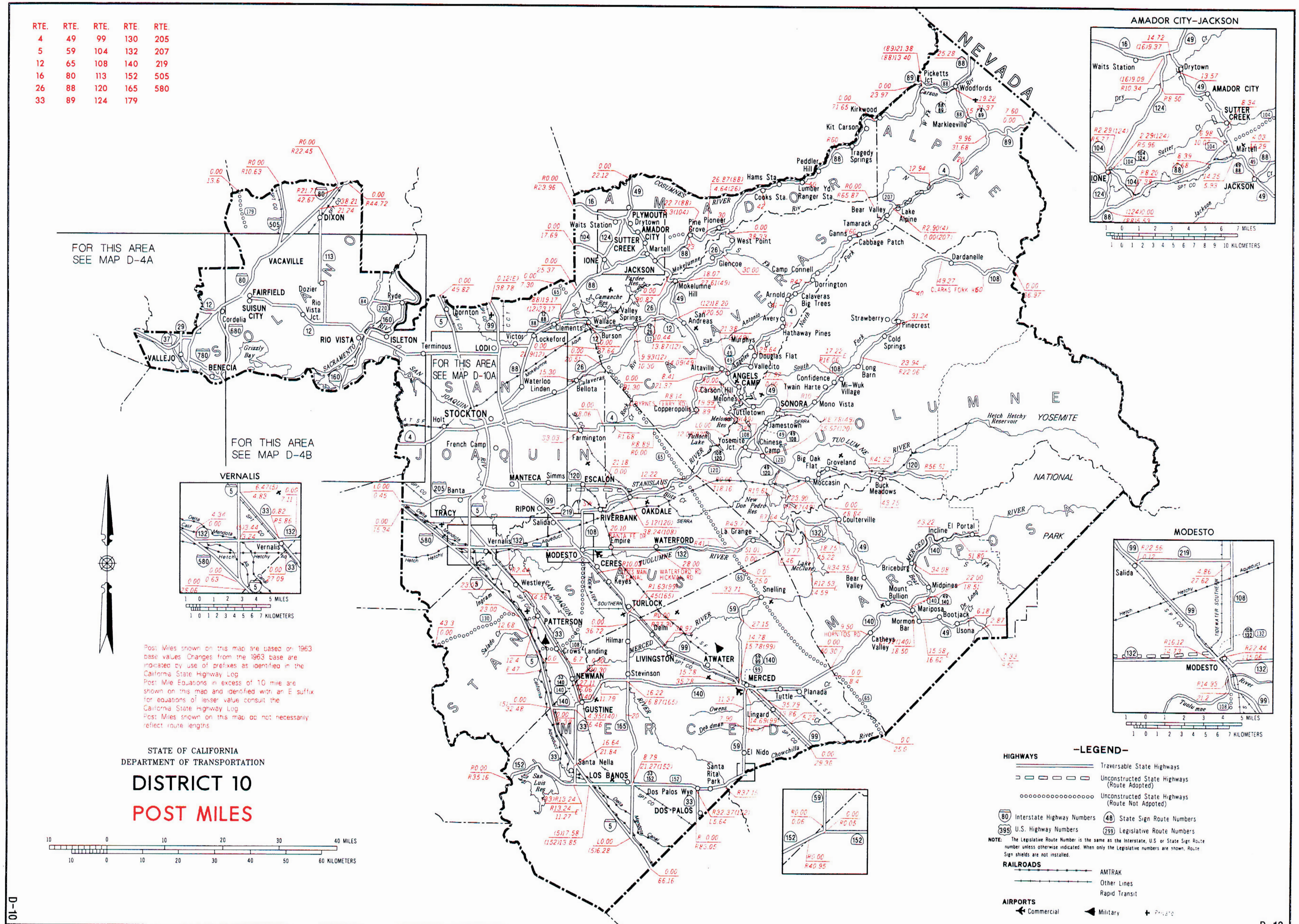
*1 AM1 | 2 D1_Tot | 3 S2_Tot | 4 S3_Tot | 5 XX

	Sum	1842	1843	1844
	55361.24	4.97	19.12	1.53
1842	4.56	0.00	0.00	0.00
1843	13.44	0.00	0.01	0.00
1844	1.16	0.00	0.00	0.00
1845	3.33	0.00	0.00	0.00

TU17_DOF_VEHTRIPS_AM1_SL.mat-*1 A...

*1 AM1 | 2 D1_Tot | 3 S2_Tot | 4 S3_Tot | 5 XX

	Sum	1842	1843	1844
	56471.73	592.64	19.12	1.53
1842	527.38	0.00	0.00	0.00
1843	13.44	0.00	0.01	0.00
1844	1.16	0.00	0.00	0.00
1845	3.33	0.00	0.00	0.00



Users noting errors or revisions on this map, please correct and forward to;
Headquarters, Office Engineer. P.O. Box 942874 Sacramento 94274-0001

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