San Luis Obispo Citywide Travel Model

user's guide

prepared for

City of San Luis Obispo

prepared by

Cambridge Systematics, Inc.

with

Central Coast Transportation Consulting

September 28, 2020

www.camsys.com

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1801 Broadway, Suite 1100
Denver, CO 80202

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1.0 Introduction

This User's Guide provides instructions on operation of the San Luis Obispo Citywide Travel Model. Information is provided regarding installation of the model, management of model scenario data, and running of the model.

The model is run from the TransCAD software platform through a customized user interface. This interface provides access to custom calculations developed specifically for the City of San Luis Obispo. Scenario and file management is achieved through a scenario management system integrated into the custom user interface. A basic understanding of the TransCAD software program is required to get the most out of the model. However, users unfamiliar with the software should be able to perform some modeling tasks with the assistance of this guide.

System Requirements

The model must be run on a computer running Windows 7 or later, preferably Windows 10. The TransCAD 8.0 software program is also required. Specific system requirements are shown in **Table 1.1**.

The listed requirements are suggested minimums; a computer that does not meet these requirements may still succeed in running the model. Increased processor speeds, multiple processor cores, and additional memory will reduce the amount of time required to run the model. The required disk space for installation must be available on the drive where TransCAD has been installed. The required disk space for additional scenarios can be on a local or network drive and must be available before attempting to run the model. However, model run times will increase significantly if the model is run from a network drive instead of a local drive.

Table 1.1 System Requirements

Operating System	Windows 7 or later (Windows 10 recommended)
Processor	Intel i5 processor or AMD equivalent *(i7 or better recommended)*
Memory	4GB or above
TransCAD Software	Version 8.0 (Tested with Builds 22215 and 22835. Other builds not recommended)
Microsoft Office (including Access)	Version 2007 or later (Version 2003 will work with reduced functionality)
Disk Space (Installation only)	3 MB
Disk Space (Input Data)	15-20 MB
Disk Space (Each scenario output)	350 MB for each scenario

Installing the Model Add-In

The model can be installed by following the steps outlined below. Solutions to common compatibility and installation problems are included in **Appendix A**.

1. **Extract the model** from provided 7-zip file to a location such as **C:\SLO Model**. Use of this location is recommended and will be used as an example for the remainder of this guide. The model may be extracted to a different location or hard drive at the option of the user.

2. **Launch TransCAD** and then set up the Add-In.

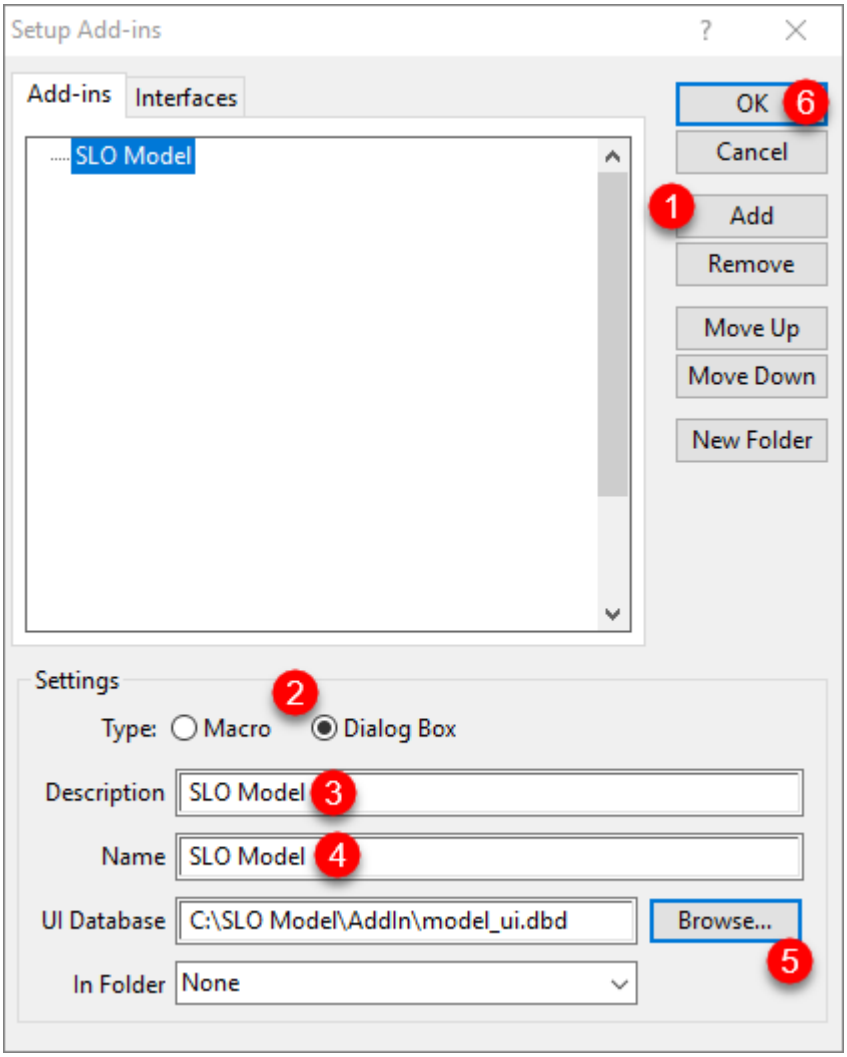
    a. In the TransCAD menu, choose *Tools → GISDK Developer's Kit → Setup Add-Ins*…

    b. Populate the Add-Ins dialog box with a new Add-In using the example dialog box below.

        i. Remember to change the type to *Dialog Box.*

        ii. Verify that *Name* is populated exactly as shown.

        iii. The *UI Database* location may change if the model was extracted to a different location.



3. The model dialog box will be available from *Tools → GISDK Developer's Kit → Add-Ins → SLO Model.*

   a. After starting for the first time, the model will appear directly under *Tools → SLO Model*.

The installation program does not provide an uninstall function. To uninstall the model, use the following steps:

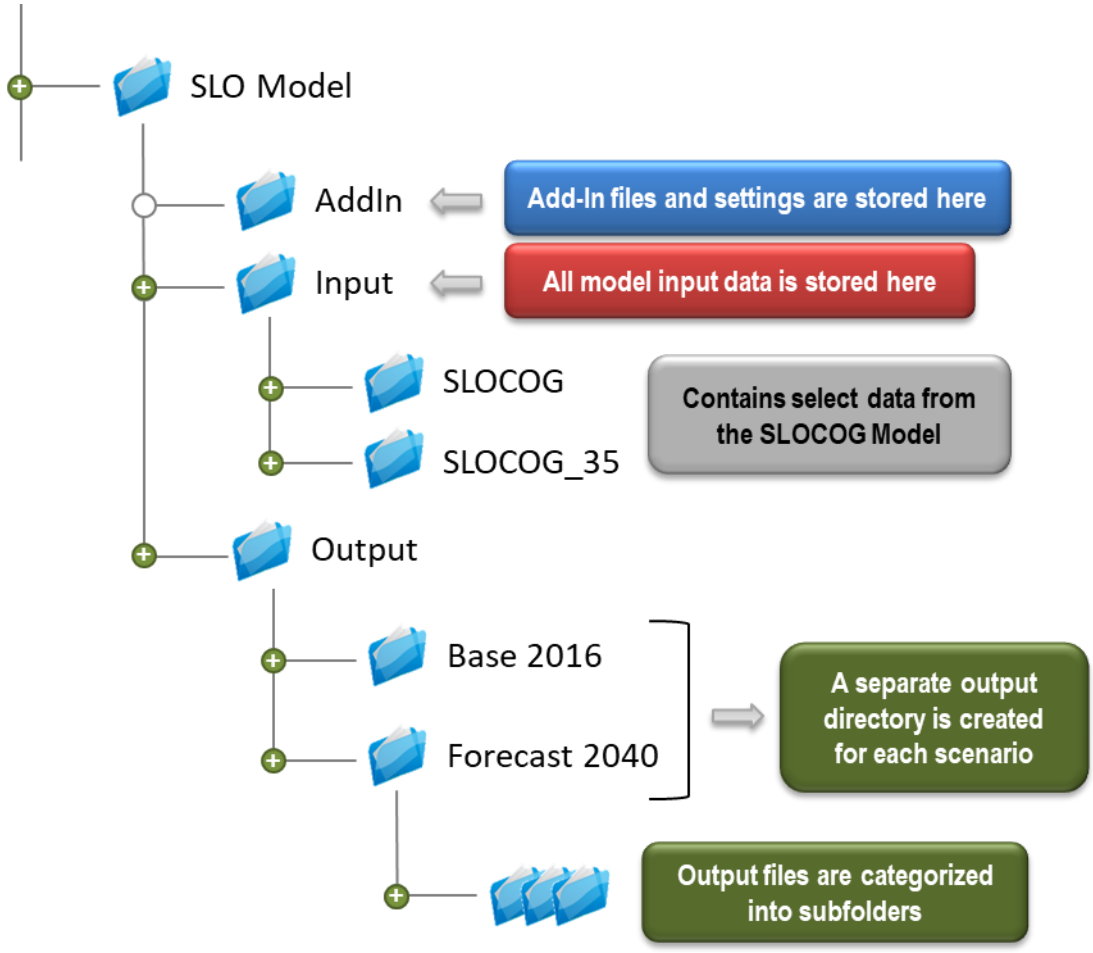
1. Choose *Tools → GISDK Developer's Kit → Setup Add-Ins*… from the TransCAD menu and remove the entry for the SLO model.

2. Remove the model folder, taking care to back up or archive any files that need to be retained.

Directory Structure

The example directory tree provided with the model and shown in **Figure 1.1** is structured to provide efficient and straightforward organization of travel model input and output files. TransCAD and the customized user interface are flexible enough to allow for adjustments to this directory structure as desired by the user.

Figure 1.1 Recommended Folder Structure



2.0 Running the Model

The model is controlled through a series of dialog boxes. These dialog boxes allow users to specify custom model run settings or to copy settings from a previously defined scenario. Users may also run the travel model, create reports and maps, and specify model run options. Steps required to complete a successful model run are described below.

Collecting the Required Data

To successfully run the travel model, various data files are required. Some input files are optional and will provide additional functionality. Each file is identified by a short keyword, as identified in **Table 2.1**. All input files should be collected and placed in a model input directory. Input files will not be modified when the model is run.

Table 2.1 Model Input Files

ID	Description and Notes	Required/Optional
Network	The Roadway Geographic File.	Required
TurnPen	An optional turn penalty file can be identified to enable specific turn penalties.	Optional (Recommended)
Database	The Model Database contains various information items and is further described later in this document.	Required
TAZ	The TAZ geographic file is not used by the model, but may be referenced for bookkeeping purposes.	Optional
KFAC	K-factor matrix file used to adjust for aggregation bias.	Required
Routes	The transit route system file.	Required
SLOCOG_PA	Year-specific regional trip generation results used for areas outside of the SLO Sphere of Influence.	Required
SLOCOG_LU	Year-specific regional land use data used for areas outside of the SLO Sphere of Influence.	Required
SelQry	Select link/node query file. If this file is present, select link analysis will be performed when traffic assignment is run.	Optional

Creating and Running a Scenario

After the input data has been collected, a scenario must be defined from the model dialog box. Model scenarios are accessible from the scenario toolbox and contain information about the following for each scenario:

- Input and output directories,
- Filenames,
- Network year/alternative,
- Data year/alternative,
- Individual alternatives, and

- Advanced settings and parameters.

Scenarios can be copied based on existing scenarios, or can be created from scratch using default settings. **Figure 2.1** through **Figure 2.5** show the scenario toolbox and editor that are used to manage scenarios, along with annotations describing the available functions.

Scenarios can be created or edited using the steps listed below. In most cases, these steps should be performed in order.

1. Specify a scenario name and identify the scenario input and output directories.
2. As necessary, identify input files by name. Most files will be found automatically, but some files may need to be located manually.
   a. Make sure to select a SLOCOG dataset consistent with the desired model demand.
3. After the status for all required files is shown as "Exists," edit the scenario settings on the General tab. Note that network and data year settings do not need to match. It is possible to run a scenario based on the 2016 roadway network and 2040 socioeconomic data.
4. *Optional:* Review the output filenames and modify if desired. Changes are not typically recommended.
5. *Optional:* Review the advanced settings and modify if desired. Changes are not typically recommended.

WARNING: The Advanced tab in the Scenario Editor allows the user to edit values that are not often changed. The advanced interface does not prevent the user from entering invalid or inconsistent data, which may cause the model to crash or produce invalid results.

The model dialog box, shown in **Figure 2.6**, provides a great deal of flexibility in how the model is run, but in most cases a very simple approach can be taken.

- To run a standard, complete model run, simply start the model dialog box, create a scenario, and click on *Step 1 – Prepare Networks*. The model will be run with the standard default settings.
- To automatically create a performance report when the model run is complete, select the appropriate checkbox.
- If buttons are grayed out and cannot be used, this is usually due to missing input files or invalid settings.

Figure 2.1 The Scenario Toolbox

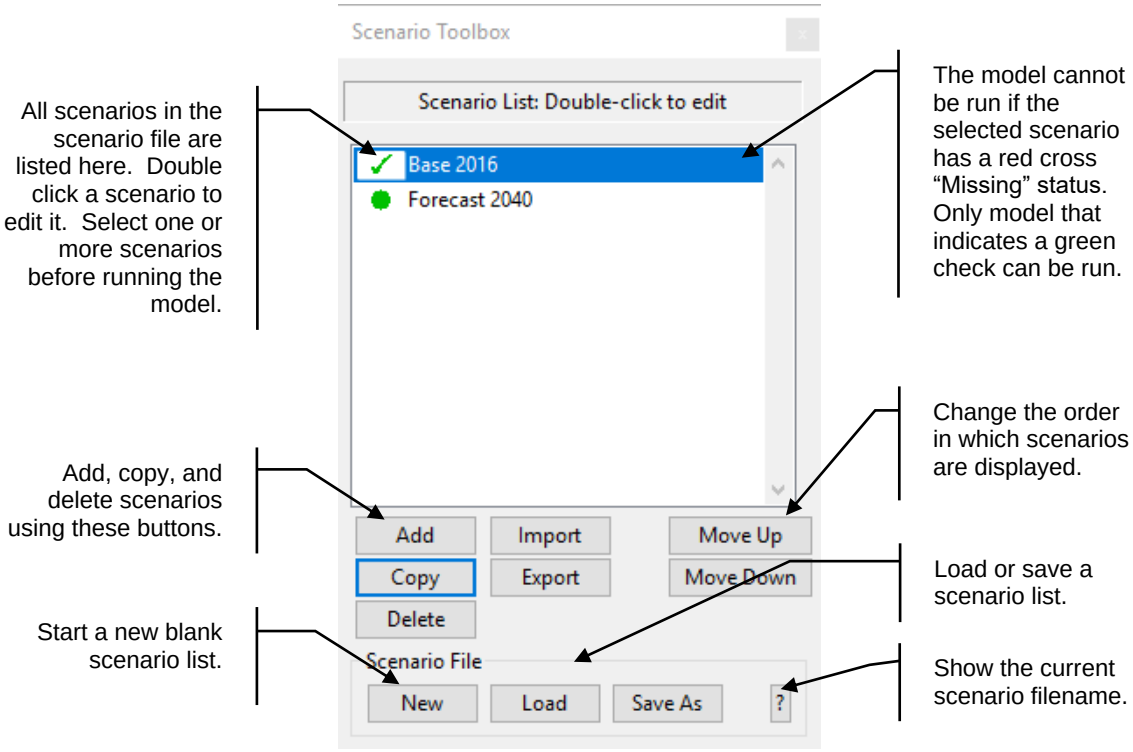


Figure 2.2 The Scenario Editor (Input Tab)

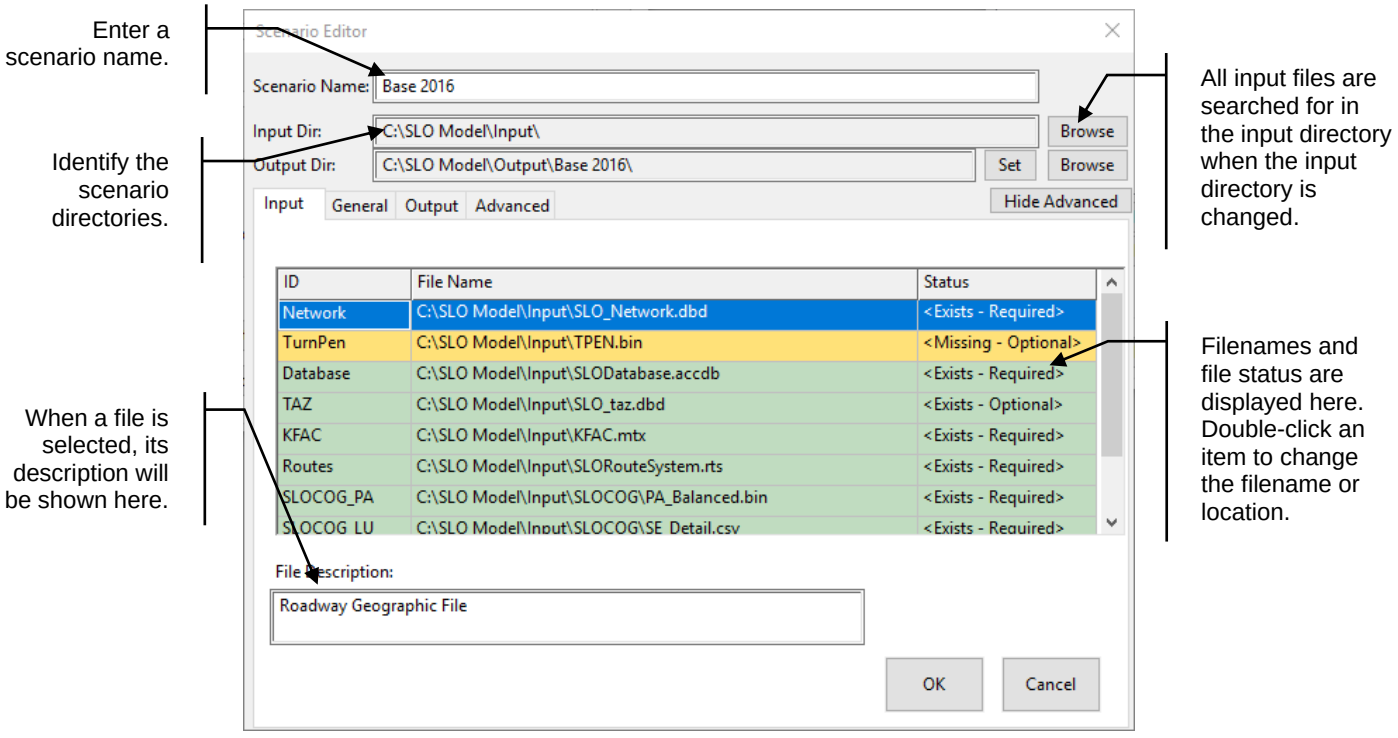


Figure 2.3 The Scenario Editor (General Tab)

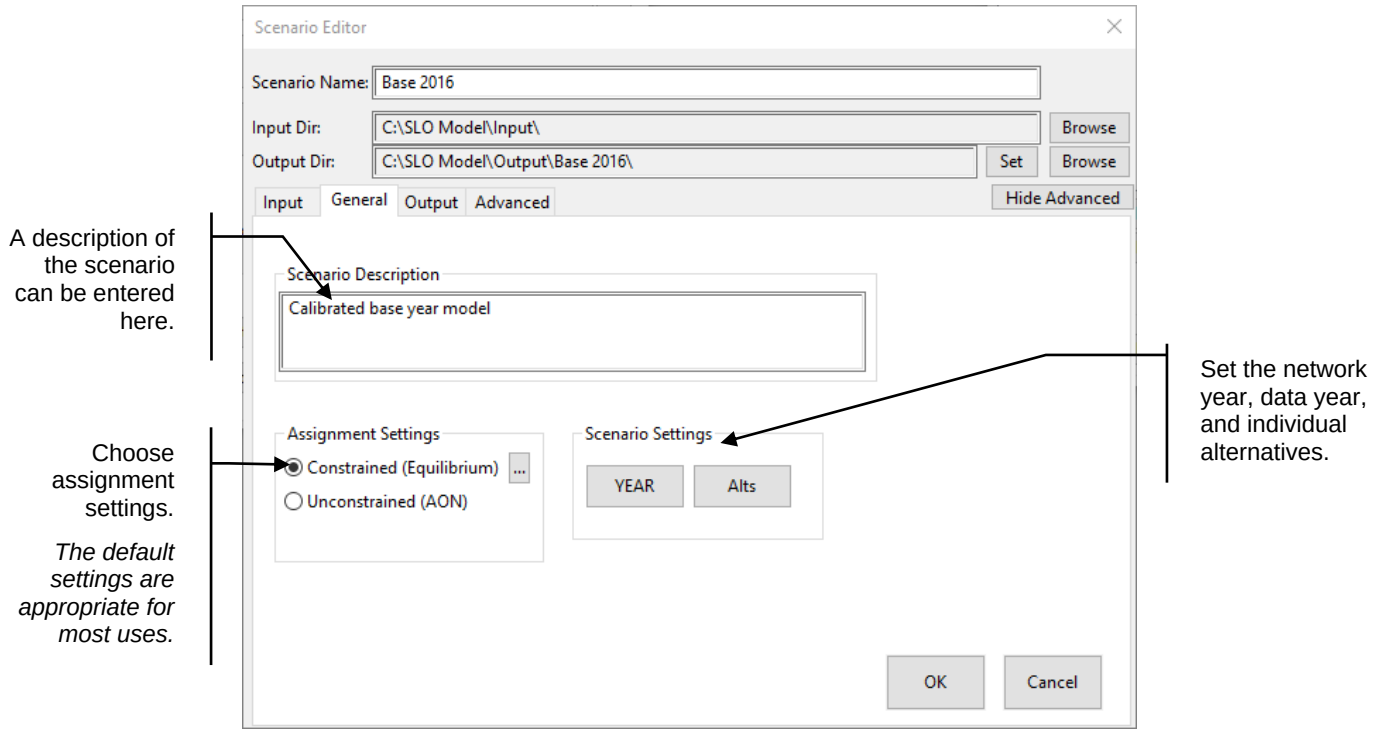
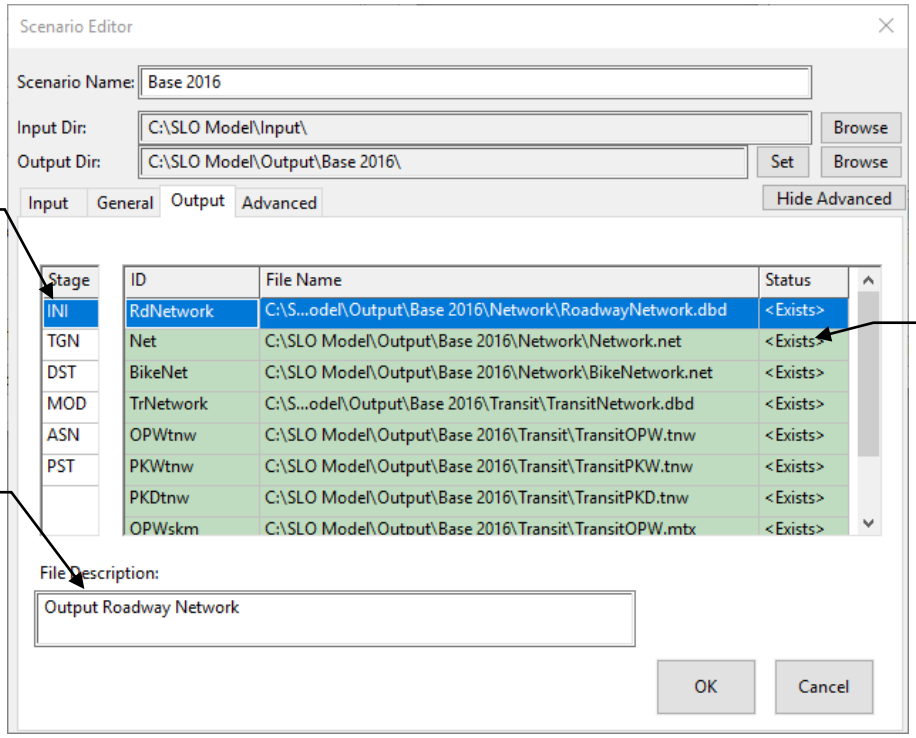


Figure 2.4 The Scenario Editor (Output Tab)



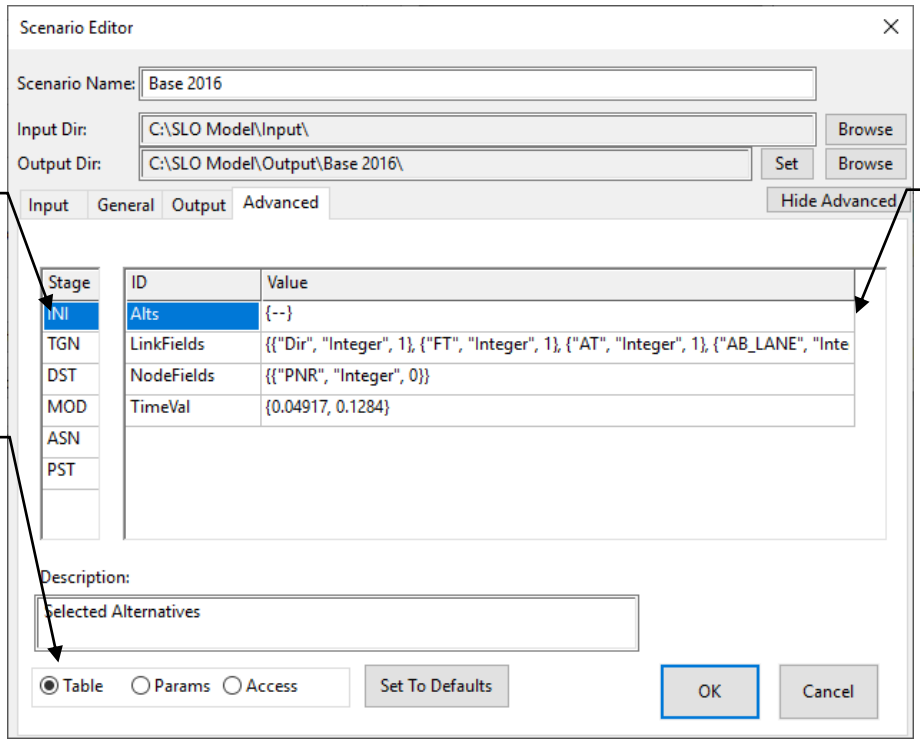
Different model stages are listed here. Files for the selected stage are shown.

When a file is selected, its description will be shown here.

Filenames and file status are displayed here. Double-click an item to change the filename or location.

Note: Files will be missing until the model has been run.

Figure 2.5 The Scenario Editor (Advanced Tab)



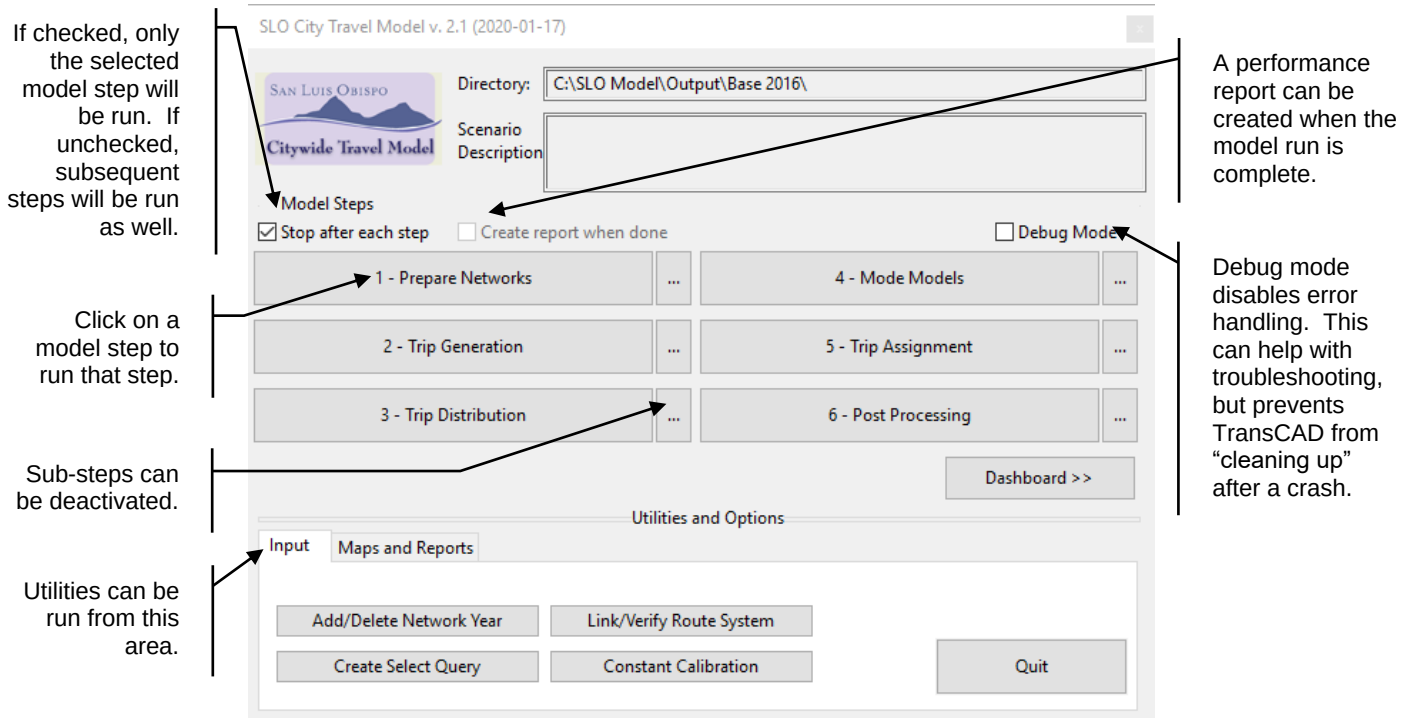
Different model stages are listed here.

Tables, Parameters, or Access Data (i.e., table names in the access database) can be selected here.

Available data is shown here. Some data can be edited directly in the grid. Arrays will be edited in a separate dialog.

Subarray data can be displayed by clicking in a cell and selecting Edit…

Figure 2.6 The Model Dialog Box

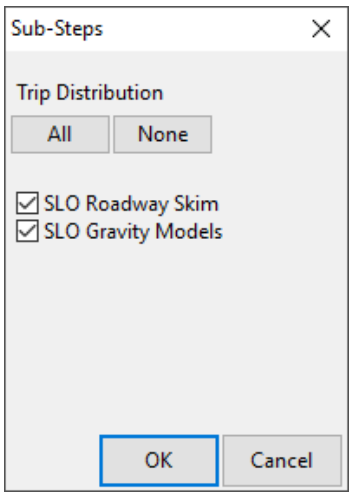


Running Selected Model Steps

The user interface can be set to run only selected model steps or sub-steps. To run only a single step, click the "Stop after each step" checkbox in the main model dialog box. When this box is checked, the selected step will be run, but subsequent steps will not. When this checkbox is cleared, subsequent steps will be run automatically.

To exclude certain sub-steps or to run only selected sub-steps, the dialog shown in **Figure 2.7** can be used. By clicking on the ··· button to the left of each model step, the user can enable or disable specific steps. The behavior of the "Stop after each step" checkbox is not changed when sub-steps are enabled or disabled.

Figure 2.7 Sub-Steps Dialog Box



3.0 Model Utilities

The Model Dashboard

The model includes a dashboard function that automates creation of commonly used maps. It can be activated by clicking the Dashboard button on the model dialog box. The dashboard supports *Roadway* maps as well as interactive *Select Link/*Zone maps. For *Roadway* maps, users can then specify a map type and then choose options described in **Table 3.1** and **Table 3.2.** Once settings have been chosen, the *Create* button will generate the specified map. The Roadway dashboard and an example volume map area shown in **Figure 3.1**.

Figure 3.1 Roadway Mapping Dashboard

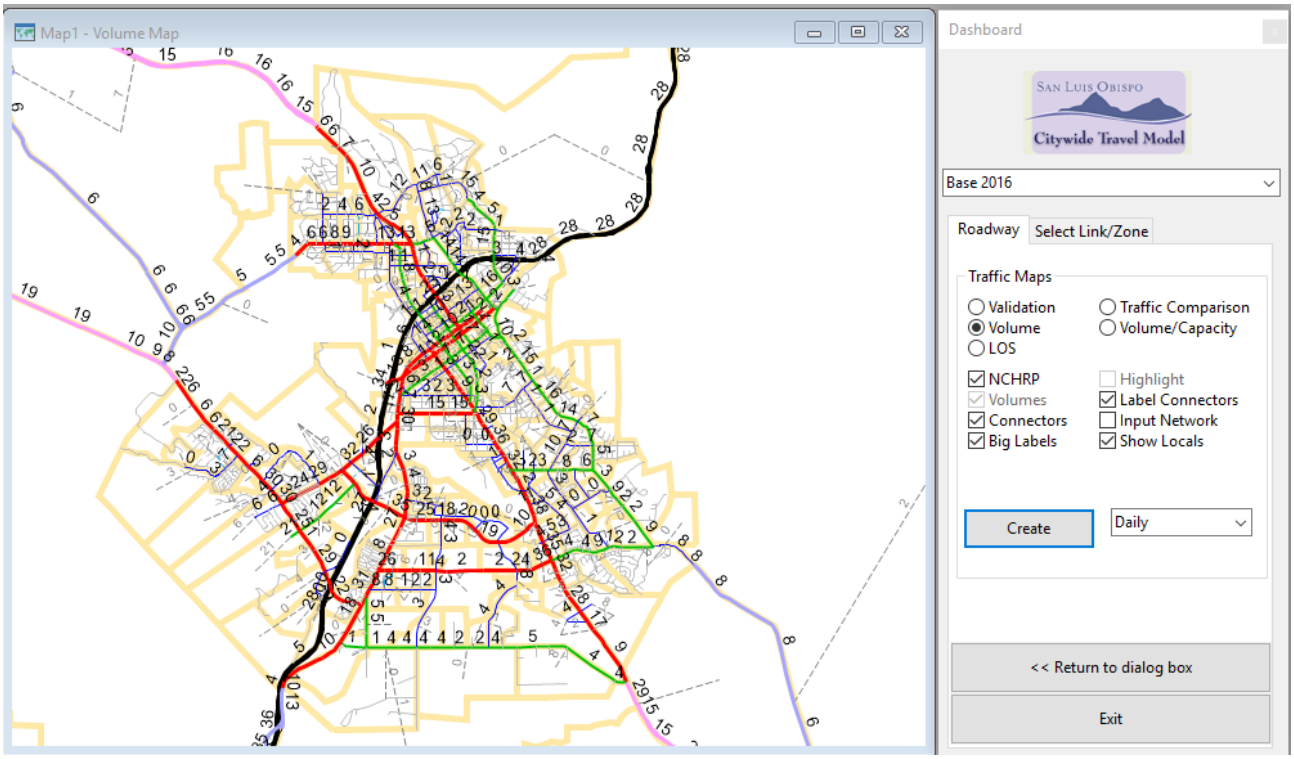


Table 3.1 Map Types

Map Type	Description
Validation	The validation map displays model volumes and traffic counts. Volumes are shown in thousands, with counts also shown in thousands, but placed in parentheses. Model results are shown on all links, while count data is only shown on links where validation traffic count data is available. If the highlight option is selected, a color-coding scheme will identify model data similar, higher, or lower than count data. This map is only meaningful when created for a base year model run.
Volume	The volume map displays model volumes in thousands. The user can opt to display daily, peak hour, peak period, or off-peak volumes.
LOS	The level of service (LOS) map displays a planning-level peak-hour LOS estimate based on 24-hour volumes.
Traffic Comparison	The traffic comparison displays the differences between two model runs. When creating this map, the user will be prompted to select a scenario for comparison.
Volume/Capacity	The volume/capacity map displays the volume to capacity ratio using a color theme. While similar to the LOS map, this map uses modeled volume and capacity data rather than a planning-level analysis.

Table 3.2 Map Options

Map Option	Description
NCHRP	If selected, the map will display NCHRP-255 adjusted volumes on links with counts instead of raw model results. Links without counts will be labeled with raw model results.
Volumes	If selected, the map will include traffic volume labels. If left blank, the model will not include labels. This option is automatically selected for validation and volume maps.
Connectors	If selected, the map will show centroid connectors. If left blank, centroid connectors will be hidden.
Big Labels	Use a larger font size for map labels suitable for on-screen viewing.
Highlight	If selected, a validation map will differentiate between links where model results are similar to, higher than, or lower than traffic count data. This option can only be selected when creating a validation map.
Label Connectors	If selected, volume labels will be plotted on centroid connectors. However, labels will only be shown if the Connectors and Volumes options are also selected.
Input Network	If selected, maps will be created using the input network instead of the output network. This option is useful if the user will be editing the network using the dashboard map as a reference. Maps based on the input network will not include calculated map fields such as freeflow speed and capacity.
Show Locals	Choose to show local streets on the map, or hide them and only show roads with a facility type of collector or higher.
Time Period	The map can be generated to show AM, PM, off-peak, or daily volumes

The model dashboard also includes an interactive select link/zone display capability. This functionality is only available if the model has been run with select link or zone analysis enabled. It allows selection of a select query and time period and will display link-based or zone-based results. This utility has the added capability

of dynamic mapping changes. When options are changed on the Select Link/Zone dashboard, the select link/zone map is updated automatically.

Note that due to the dynamic nature of these maps, select link/zone maps created with this utility cannot be saved. If the user saves select link/zone maps to a file, they will fail to re-open.

Input Utilities

The model dialog box includes several utilities that can be used in preparation of model inputs. These utilities, described below, will only be available if all required input files for a scenario have been identified and are present.

Add/Delete Network Year

The model roadway network is designed to contain data for various distinct scenarios. This tool will allow network years to be added or deleted and can be operated, as described below.

1. Select a model scenario that references an input network. The referenced input roadway network will be modified.

2. Click the *Add/Delete Network Year* button in the main model dialog box (Input tab); the dialog box shown in **Figure 3.2** will appear.

3. **To add a network year:**

   a. Select a year from the drop-down list.

   b. Click the *Copy* button. The tool will make an exact copy of the selected year. If the *Alternatives* option is enabled, you will be prompted to select alternatives to be included in the new network year.

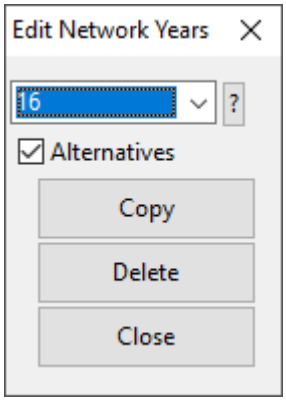
   c. Attributes for the new network year can be modified by opening the network file and using tools available in the TransCAD software.

4. **To delete a network year:**

   a. Select a year from the drop-down list. Note that the base year network cannot be deleted.

   b. Click the *Delete* button. The tool will delete all data fields associated with the selected year.

Figure 3.2 Add/Delete Network Year Dialog Box



Network years can contain up to four digits. A recommended practice is to use a two- to four-digit code formatted as follows:

YYXX

Where:

YY represents the network year (e.g., 05 for 2005 or 40 for 2040); and

XX is an optional descriptor (e.g., 05A, 05B, 40A, 40B, etc.).

Create Select Query

A select link or node query file (*.qry) can be created for a scenario using the Select Link/Zone Query Builder provided with the TransCAD software. This toolbox, accessed from *Planning → Assignment Utilities → Select Link/Zone Query Builder*, is explained in the TransCAD software documentation and online help system. It can be used to interactively create a query, or can create a query based on a link selection set. However, it cannot be used to create a select zone query based on a node selection set. The *Create Select Query* tool can be used to create a select zone query based on a node selection set. To use this tool, follow the steps listed below.

1. Add the attributes, as needed, to the input network node layer (e.g., use a subarea ID).
2. Create a scenario that references the modified input network and select this scenario.
3. Click the *Create Select Query* button in the main model dialog box (Input tab). The system will prompt the user if an existing select link/query file is specified for the selected scenario.
4. Enter a name for a new select zone query.
5. Select the query method:
   a. To or from: Track trips departing or arriving;
   b. From: Only track departing trips; or
   c. To: Only track arriving trips.

6. Enter a selection condition when prompted.

7. When prompted, choose whether to add an additional query to the query file.

Once the query file has been created, it can be viewed and edited using TransCAD's *Select Link/Zone Query Builder* or can be used as input to a travel model scenario.

Maps and Reports

The model contains mapping and reporting utilities that can be used to produce additional model outputs and summary data. These tools, described below, will only be available if all selected scenarios have been successfully run and read "done" in the status column. Some of these utilities can only operate on one scenario at a time and will be disabled when multiple scenarios are selected.

Create Performance Report

This tool will allow the user to create a standard summary report for all selected scenarios. The user will be prompted to select performance report options prior to report creation. The summary report can be created automatically upon model completion by selecting the *Create report when done* option. This utility is useful for creating a report with different options, or in cases when the *Create report when done* options was not selected.

Create Maps

This tool will create a set of standardized maps in the model output directory. Maps that are created can be opened from TransCAD once the utility completes.

Traffic Comparison Map

This tool will create a map that compares the results of two model scenarios. To use this tool:

1. Select a single completed scenario;
2. Click the *Traffic Comparison Map* button (Maps and Reports tab); and
3. Select a completed scenario for comparison.

Process Turns

The travel model saves turn movement information for selected intersections during the traffic assignment routines. No calibration or validation process has been performed to ensure that turn movements produced by the travel model are reasonable or realistic. Raw movement data should not be used directly for analysis, so a utility is provided to adjust data using processes defined in the National Cooperative Highway Research Program (NCHRP) 255 and reiterated in NCHRP-765. TransCAD also contains built-in utilities for estimating turn movements based on link flows that can be used to get a general sense of activity at an intersection. When using any modeled turn movements, careful inspection of existing turn movement count data, base year modeled turn movements, and forecast year turn movements is advised.

The Built-In Turn Movement Utilities

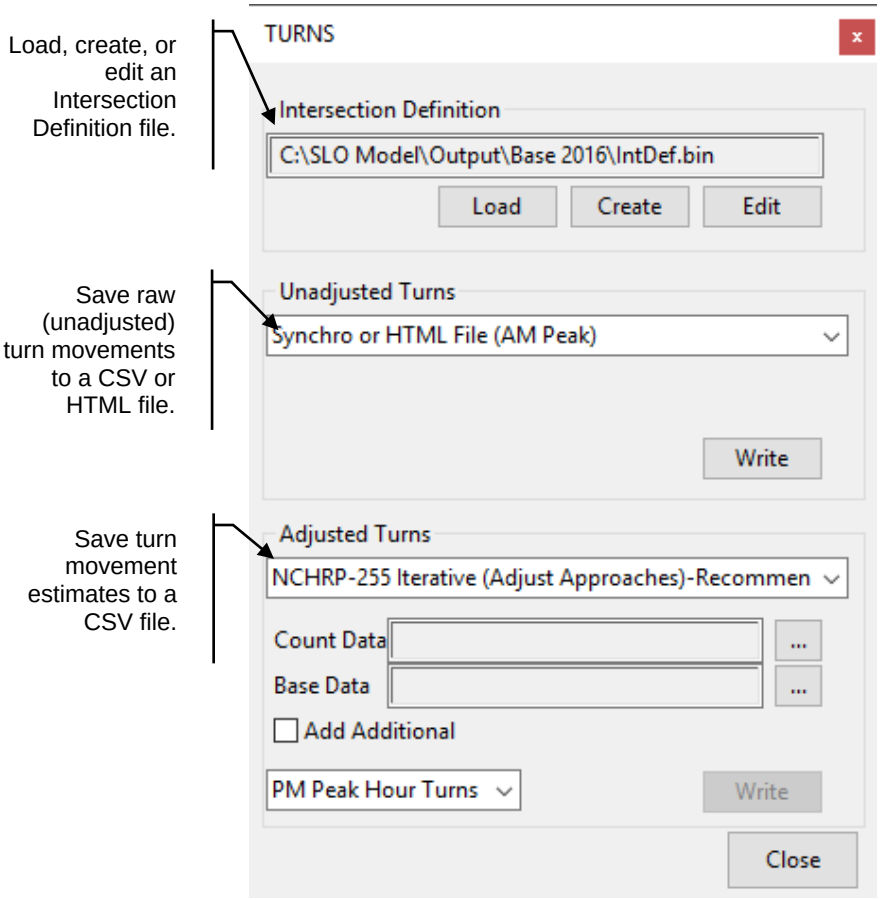
The built-in turn movement utility can be accessed after opening or creating a map that includes traffic assignment results (e.g., in a joined view). To view estimated turn movement results, click the intersection diagram tool in the main mapping toolbox:  , and then select a node. After settings are entered in the dialog box that appears, an intersection diagram will be created. For additional details on operation of this function, see the TransCAD program documentation.

Alternately, raw modeled turn movements can be viewed using the tool accessible from Planning → Assignment Utilities → Display Intersection Flows. Modeled turn movement volumes for each assignment are saved in TurnsAM.bin, TurnsPM.bin, and TurnsOP.bin. Turn movements are only saved for intersections with a value in the INT_ID node field. When saving turn movements, each node with a value in the INT_ID field should contain a unique positive number.

Turn Movement Add-In

Operation of the intersection processing utility requires additional data and is only run for selected intersections. Intersections in the travel model that are included in analysis are identified by the INT_ID field on the node layer. All intersections with a value in this field can be included in the analysis. This ID also serves as a link between the TransCAD network and information contained in another database, such as a Synchro network. For functions requiring count data and to export data to in an external format, the INT_ID field on the node layer must match the node ID of intersections in a turn movement count file and a Synchro network. The turn movement processor currently is limited to intersections with three or four legs. To access turn movement add-ins, click the *Process Turns* button on the main model dialog box (Maps and Reports tab). This will open the dialog box shown in **Figure 3.3**.

Figure 3.3 The Process Turns Dialog Box



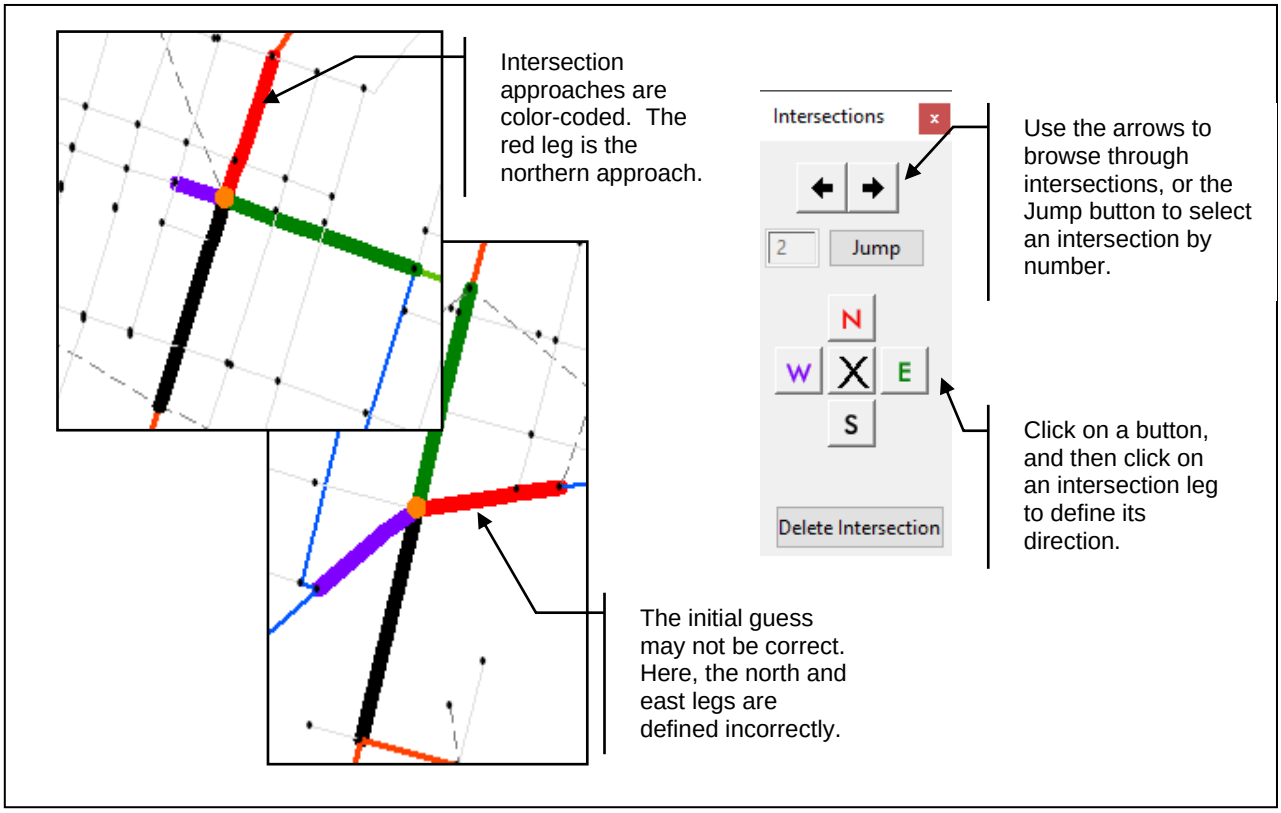
Intersection Definition File

All turn movement functions require an intersection definition file that identifies the configuration of each intersection selected for analysis. A new intersection definition file can be created from the turn movement dialog box, or a previously created definition file can be loaded. Turn movement definition files reference INT_ID values and link ID values, so a new definition file must be created after certain input file modifications.

Once an intersection definition file is created, it should be verified for accuracy. For functions requiring existing traffic count data, the intersection leg definitions must match the definitions present in an input data file. Definition files should be checked manually to ensure that the correct legs are identified at each intersection. To do this, click the *Edit* button after creating an intersection definition file. If necessary, correct the intersection definition file by adjusting the definitions of each intersection, as shown in **Figure 3.4**.

The turn movements utility cannot process intersections with more than 4 legs or with diagonal legs. To work within this limitation, all intersection approaches must be set to N, S, E, or W and 5-legged intersections must be evaluated manually.

Figure 3.4 Editing the Intersection Definition File



Unadjusted Turns

Unadjusted turn movements can be saved to a comma separated variable (.csv) file. This file can then be read using a program, such as Excel, or can be imported to Synchro. For import to Synchro, intersection ID numbers and approach directions must be consistent. Unadjusted turns from a base year (i.e., 2008) scenario are also required as an input file when outputting adjusted turns for forecast scenarios.

Adjusted Turns

The model can adjust turn movements using iterative post processing procedures. Use the steps described below to export adjusted turn movement data to a CSV file that can be read into Synchro, Excel, or other traffic analysis software.

1. **Identify Intersections in the TransCAD Network:**
   Enter the intersection ID in the INT_ID field in the node layer of a TransCAD network. If a separate network is to be used for the calibrated base year model run, INT_ID values must be entered in this network as well. The INT_ID field should be cleared for nodes or intersections that will not be post processed (e.g., intersections where count data is not available).

2. **Run the Base and Forecast Year Travel Model:**
   The base year and forecast year model scenarios should be run in full with INT_ID information present in both networks.

3. **Create a Base Year Intersection Definition File:**
   Use the *Process Turns* utility to create an intersection definition file. Ensure that all intersection approaches are defined in a manner consistent with count data.

4. **Export the Unadjusted Base Year Model Turn Movements:**
   Save the turn movement data and make a note of the file name and location.

5. **Create a CSV File Containing Observed Turn Movement Data:**
   This file must contain complete turn movement data for each intersection that is to be analyzed. The file can be created by exporting turn movement data from traffic software or an Excel template, or by modifying the unadjusted base year model turn movement file to contain turn movement count data.

6. **Load or Create a Forecast Year Intersection Definition File:**
   In most cases, the file created for the base year can be reused. However, it may be necessary to create a new file in some cases. If in doubt, use the *Edit* function to verify that a loaded intersection definition file is correct.

7. **Export the Adjusted Forecast Turn Movements:**
   CSV files containing base year count data and base year unadjusted modeled turn movements must be referenced. Exported turn movements can be loaded into Synchro or a spreadsheet program for additional analysis.

Once the above steps have been followed, an adjusted turns CSV file will be created. This file contains turn movement forecasts that are based on observed turn movement counts and travel model forecasts. However, these forecasts are *estimates*. Professional judgment should be used when interpreting the results. In cases where intersection configurations change or where turn movement count data is suspect, manual intervention will be required. Also, if more detailed information such as a traffic study is available, this information should be used in addition to or even instead of these planning-level forecasts.

4.0 Model Database

The model requires a large and varied set of input data for each model run. Specific data items are required inputs for each step of the travel modeling process. The data is contained in three primary places:

8. **Spatial Data.** The roadway line layer and transit route system contain the supply side information used by the travel model. In addition to these networks, several supporting files are also required (turn penalty tables and mode tables). The traffic analysis zone layer is also input to the travel model, but TAZ data is not stored directly in the TAZ layer.

9. **Model Database.** The model database contains socioeconomic data and other demand side information used by the travel model. The database also contains model parameters such as trip rates, and other zonal data such as area type.

10. **Scenario Manager.** Some model parameters are stored directly in the scenario manager. The majority of these parameters are not typically changed.

This chapter provides a detailed description of the data and parameters contained in the model database.

Database Approach

The SLO Citywide Travel Model relies on a large amount of data and numerous parameters and lookup tables. The TransCAD software provides a table format that can be used to store this type of information. The TransCAD table format is relatively efficient and very stable, and allows for sufficient precision in storage of decimal numbers. This format, Fixed Format Binary (FFB), has been used to store all data output from the travel model in table format. An Access database has been used to store the majority of data that is input to the model. The Access format has been used rather than the FFB format for the following reasons:

- The TransCAD table format cannot be read or edited, except with the TransCAD software.
- The Access database can be used to store nearly all of the input data required for the travel model. This prevents the need to manage a large number of input files that contain data for various model steps.
- SQL queries within the Access software can be used to transform data from an easy to ready format into a format that is readily used by the travel model.
- The Access database format is designed to allow multiple data scenarios to be managed within a single consolidated database file.

The model has been designed to support two types of scenarios: network scenarios and data scenarios. Network scenarios are stored in the TransCAD geographic line layer, while data scenarios are stored within the model database. A virtually unlimited number of data scenarios can be maintained within a single database, but in practice it may be useful to maintain different databases for different purposes. For example, one database may be desired for use in the citywide planning process while a different database could be maintained to facilitate testing of minor land use alternatives associated with proposed development.

The database contains some information that is static (does not change when a different data scenario is selected), and other data that is varies by data scenario (scenario-specific). The static and scenario-specific data items are listed below. A detailed description of each data item is provided in the sections that follow.

Static Data:

- Roadway Parameters (lookup tables by facility type and area type);
- Household Size, Income, and Worker Disaggregation Curves;
- Trip Generation Rates (production and attraction rates);
- Trip Rate Factors;
- Friction Factors (gamma parameters);
- Mode Choice Parameters (coefficients and constants); and
- Time of Day Parameters.

Scenario-specific Data:

- Land Use Data (SLOCOG data and City data);
- Regional Bivariate Data (household size and income);
- Other TAZ Data (area type, parking cost, K-district);
- Special Generator Data; and
- External Station Data.

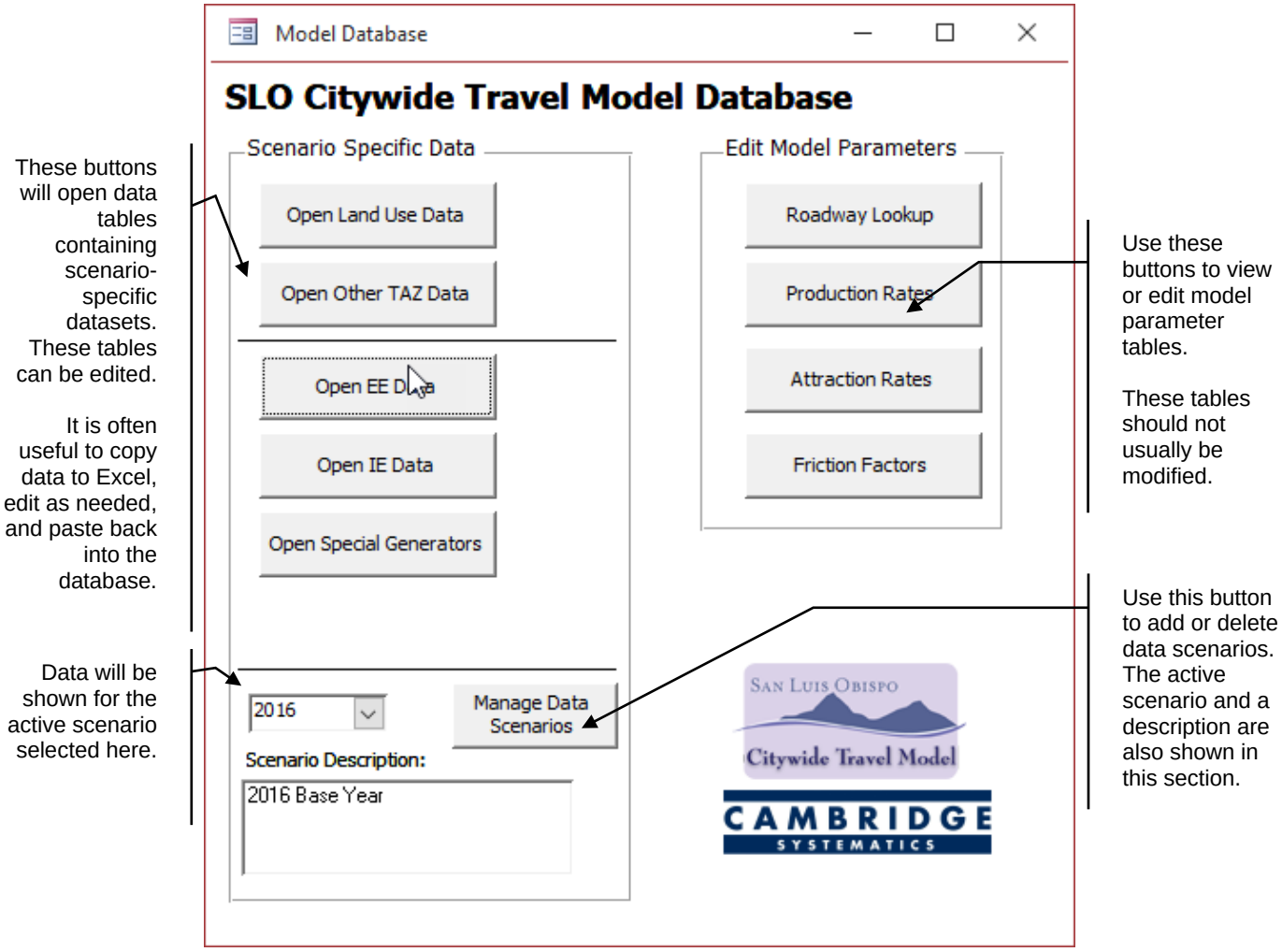
Database Interface

When opened, the model database will present the user with a request to enable VBA macros. Once macros are enabled, the database interface form will appear. This form provides automated management of data scenarios and guided access to key datasets. The interface is annotated in **Figure 4.1**.

To modify dynamic data for a specific data scenario, set the active scenario to the desired year and open the scenario-specific datasets from the main interface dialog box. Data can be edited directly in Access. Alternately, data can be copied from Access and pasted in Excel. Once data has been modified, it can be pasted back into the Access database.

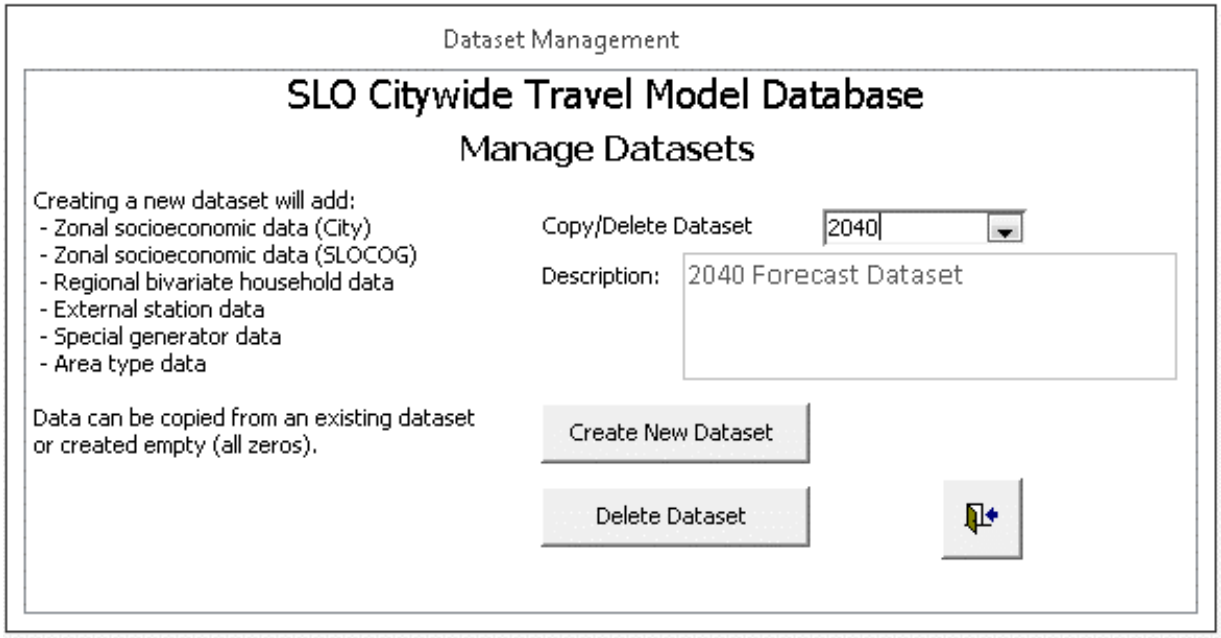
Not all datasets can be accessed directly from the database interface form. These datasets can be accessed by directly opening the desired data table.

Figure 4.1 Access Database Form Interface



The user interface provides functionality that will create a new scenario by copying scenario-specific data or delete an existing data scenario. The dialog box that provides this capability is shown in **Figure 4.2**. Once a new dataset has been created, socioeconomic data, special generator data, EE data can be modified for the new scenario.

Figure 4.2 Data Scenario Management



Database Tables

Information is stored in tables within the Access database file. A list of the tables and a description of the contents are included in **Error! Reference source not found.**. For some tables, SQL queries are used to reformat process or format compatible with the model. SQL queries are also used to filter dynamic datasets to show data only for the selected year.

All tables that contain model data are prefixed with the letter a. Queries based on tables use the same name as the source table, but include a suffix consisting of an underscore and a number (e.g., _1). Tables, queries, and forms prefixed with an x, y, or z are present only for use with the program interface and are not listed in **Table 4.1**.

Table 4.1 Access Database Tables

Table Name	Description
Roadway Network Tables	
aRoadwayLookup	Contains roadway parameters by facility type and area type.
TAZ Data Tables	
aSLOCityData	Land use data for zones within the SOI, based on the City's parcel dataset.
aSLOCOG_Equiv	Equivalency table that matches external SLOCOG land use data to SLO Citywide Model zones
Household Model Tables	
aDisaggIncome	Household income disaggregation curves.
aDisaggSize	Household size disaggregation curves.

Table Name	Description
aRegBivarPct	Regional bivariate distribution of households.
Trip Generation Tables	
aAttractionRates	Attraction rates.
aProductionRates	Production rates.
aSpecialGen	Special generator values.
aTripRateFactors	Trip rate factors by K-district.
External Trip Tables	
aEETrips	External/External trip table.
aIETrips	Internal/external and internal/external trip table.
Trip Distribution Tables	
aFrictionFactors	Friction factor gamma parameters.
aTerminalTime	Terminal time values by area type.
Mode Choice Tables	
aModeCoefficients	Mode choice model utility coefficients.
aModeConstants	Mode choice model utility constants.
aModeNests	Mode choice model nesting parameters.
aModeTargets	Target values for mode choice calibration
Trip Assignment Tables	
aLoadingFactors	Traffic assignment loading factors (1 for all periods).
aPeakFactors	Daily to peak/off-peak factors.
aPeriodFactors	Daily to peak period factors (AM/PM/Off-peak).
aLOSCap	Daily planning-level level of service capacities.

5.0 Working with Transit Data

The San Luis Obispo Citywide Travel Model includes the first mode choice model in the region. This section provides some guidance on working with the transit Route System as an input file, as well as guidance on and viewing transit assignment results.

Maintaining the Route System

The TransCAD route system is based on the roadway network geographic file, or the street line layer. Because the route system relies on the roadway network, it is important to carefully maintain the link between these two files. This can be accomplished by always ensuring that the route system is correctly linked to the roadway network; and that the route system is present in the map when adding, deleting, splitting, or joining links in the roadway network.

Route System Link and Verify

Prior to making any changes to the route system or roadway network, it is good practice to link the route system to the roadway network and verify the route system's integrity. This can be done by using the *Link/Verify Route System* utility available from the main model dialog box. When activated, TransCAD will ask the user to identify a route system, then the corresponding roadway network file. TransCAD will link the selected files, and then check for errors in the route system.

Note: A common mistake is to accidentally select the route system stop layer (a "dbd" file), instead of the roadway network layer. If this is done, the Link/Verify utility will not make any changes to the route system, but will show an error message instead.

Maintaining Route System Integrity

Because the route system is directly linked to the roadway network, TransCAD must modify the route system any time a change is made to the roadway network layer. This is particularly important if a roadway link that is traversed by a transit route is split, moved, or joined to another link. When this happens, TransCAD will update the route system data to account for the change. The easiest and least error-prone method of updating the route system is to add it to the map prior to modifying the roadway line layer. After modifying a link that is traversed by a route, the user must set the route system as the active layer to cause TransCAD to update the file.

If a user edits the roadway layer while the route system is not present in the map, TransCAD will update the route system next time it is opened. This update takes place even if none of the links that have been modified is traversed by a transit route. To ensure that a route system is up to date, the following procedure should be used, regardless of whether the route system was present in a map during network edits:

1. Close all files in the TransCAD program.
2. Run the *Link/Verify Route System* utility.
    a. If this utility fails, continue to Step 3 anyway.

3. Open the route system in TransCAD.
   a. Verify that the correct line layer was opened automatically to support the route system.
4. Close all files.
5. If the *Link/Verify Route System* utility failed in Step 2, run the utility again. If the route system verification still fails, the route system must be repaired manually. (This is uncommon and will typically only occur if the guidelines in this section are not followed.)

It is only necessary to follow the guidelines specified above when splitting, joining, adding, and deleting links from the roadway network. The steps above are not necessary when modifying attributes of existing links.

Editing the Route System

The route system can be edited with the *Route System Editing Toolbox*. However, this toolbox requires a network (*.net) file, as well as a geographic (*.dbd) file. Prior to opening the *Route System Editing Toolbox,* create a working network as follows:

1. Open the route system and verify that the correct line layer has been opened with it;
2. Set the line (roadway) layer as the active layer;
3. Create a new network from *Networks/Paths → Create*;
4. Save the network using a generic name (e.g., net.net or temp.net); and
5. Use the default network settings.

After the network file has been created, the route system can be edited. The *Route System Editing Toolbox* is activated by setting the route system as the active layer, and then selecting *Route Systems → Editing Toolbox* from the TransCAD menu.

The TransCAD documentation provides detailed guidance on route system editing tools. However, some additional guidelines are provided here to ensure that route systems will work properly.

Route stop problems are usually reported in the Log file that is generated during the first model step. If the route system has been modified in any way, this file should be inspected for warnings and errors. However, the log file will not indicate all.

Warning: ***Route stop problems do not always cause the model to crash.*** Problems are often reported in the Log file that is generated during the first model step. If the route system has been modified in any way, this file should be inspected for warnings and errors. However, the log file will not indicate all problems.

Route Direction

All routes are coded directionally from start to finish. If a route traverses a street more than once (e.g., out and back along the same corridor), it must be coded to travel out and then back. A simple way to think of this process is to code the route exactly as it is driven.

Each numbered or named transit route should be coded as a single route, usually starting and ending at the same place. If a layover time is experienced at a particular stop, the route should start and end at this point.

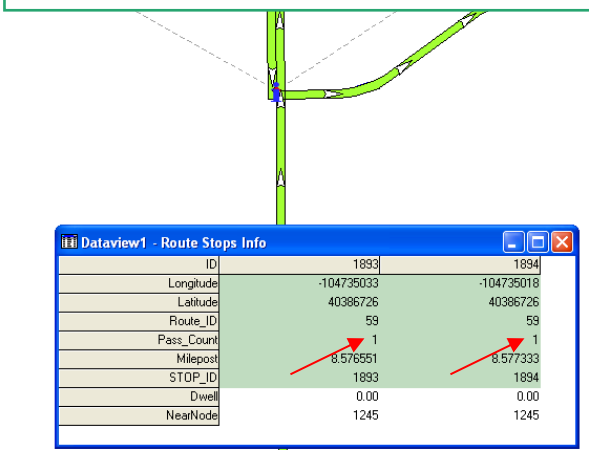
Stop Placement

1. With the exceptions noted below, only one stop for each route should be placed at each node. This includes locations where the route transitions from a loop portion to a two-way portion. In these cases, a two-pass stop should be located on the two-way portion of the route. Failure to observe these requirements may cause stops to work incorrectly and will cause "Incorrect Tag Info" warnings in the log file.

   Exceptions:

   - Beginning/End of Route – See Item 2 below; and
   - Multi-Pass Routes – See item 5 below.

Example: Incorrectly placed stop at a two-way/ loop transition. Two stops sharing a node *must* have different values for Pass_Count.



2. A route stop should be placed at the beginning *and* end of each route. The model algorithms will not verify that this condition is met, but failure to properly place route-end stops will result in incorrect transit paths, but no errors or warnings will be generated. This is especially important on loop routes.

3. Route stops should be placed on routes at all locations where walk access to transit might be available, but ***all stops must be placed at street layer nodes***. Route stops are not needed at nodes where walk access cannot be achieved, or where other nearby stops on the same route can be reached more quickly from all nearby zones.

4. TransCAD does not "snap" route stops to line layer nodes, but all route stops must be placed close to a node on the roadway line. If any stops are placed too far from the nearest node, the travel model will produce a warning and the stop will be ignored.

5. If a route doubles back (e.g., a two-way route), stops should be placed on the route at both first and second passes. Two-pass stops on a single node are usually displayed as a stop icon with a "2" in TransCAD.

6. At a point where a route reverses, but does not start or end, only one stop should be placed. If two stops are placed at a mid-route reversal, the model will not work correctly and may fail to run.

5.1 Viewing Transit Assignment Results

Transit assignment results are stored in several files with varying levels of detail. Transit assignment results are itemized and described in Table 5.1.

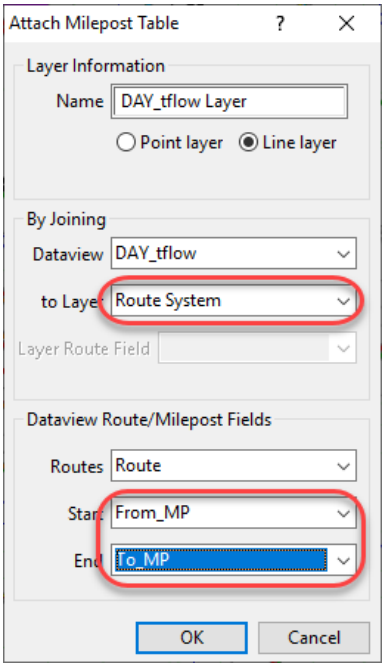
Table 5.1 Transit Assignment Results

Filename	Contents	Description
DAY_tflow.bin	Route flow data	This table contains segment-level route ridership data. It can be viewed by attaching it to the route system, as described below.
DAY_wflow.bin	Walk flow data	This table contains walk access and egress flows. It can be joined to the line layer by link ID.
DAY_aflow.bin	Aggregated route flow data	This table contains segment-level aggregated ridership data. If multiple routes traverse the same segment, this table contains the sum of ridership on these routes. This table can be viewed by attaching it to the route system, as described below.
DAY_OnOff.bin	Boarding/alighting data	This table contains boarding and alighting data by stop. It can be joined to the stop layer based on Stop IDs.

Note: In addition to the files listed, separate files are available for peak walk (PKW), peak drive (PKD), and off-peak walk (OPW). For these files, the text "DAY" is replaced by the identifiers listed above.

5.1.1 Attaching Route Data

Route data is stored using a linear referencing system. TransCAD can display this data as a layer that can be viewed in a map. To do this, follow the steps below.



1. Open the output route system in a map.
2. Open a *tflow* or *aflow* file in TransCAD.
3. Activate the map window and ensure that the route system is the active layer.
4. Select *Route Systems* → *Linear Referencing* → *Attach* from the TransCAD menu.
5. Fill in the dialog box, as shown below. ***Note:*** *The start and end fields are not filled in correctly by default.*
6. Click OK.

The result will be an additional layer in the TransCAD map window. Transit flow on each route segment can be viewed with the *Info* tool. If multiple routes share a segment, multiple co-linear segments can be selected with the *Info* tool by clicking on the segment, and then dragging outward to create a circle.

6.0 Generated VMT

The model summary report (Summary.html) contains a **Generated VMT** section. This section reports specific types of VMT generated by land uses in the City, the SOI, and the county as a whole. It also includes a column summarizing assigned VMT. The contents of this table are described further below.

- **Residential VMT** represents home-based trips generated by residential land uses. Residential VMT is calculated using trip tables for all home-based trips produced in the selected zones (i.e., City, SOI, or County).

- **Commute VMT** represents all direct commute trips generated by non-residential land uses. Commute VMT is calculated using trip tables for all home-based work trips attracted to the selected zones.

- **Assigned VMT** represents the VMT that occurs in each of the three summary areas, as obtained from traffic assignment results. Assigned VMT does not indicate the area where trips originate, but where the VMT occurs.

Generated VMT

	Residential VMT	Commute VMT	Assigned VMT
City	389,415	771,327	886,581
SOI	406,448	900,794	1,027,441
County	4,266,319	1,785,801	8,486,285

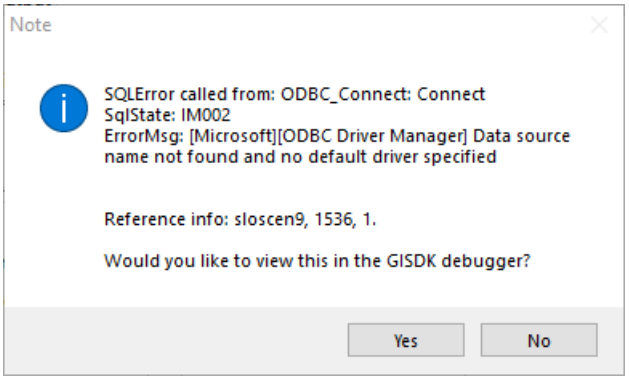
Appendix A. Installation Troubleshooting

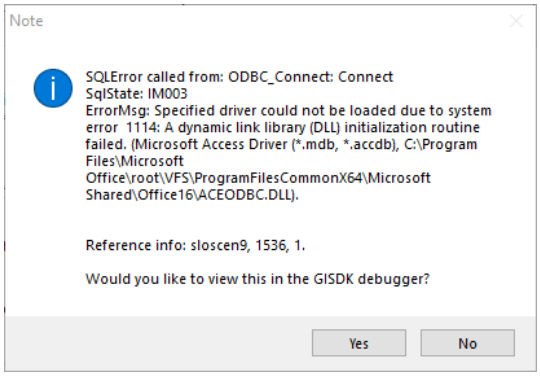
A.1 ODBC Driver Errors

Microsoft Office 365 can sometimes introduce compatibility issues that prevent the SLO Citywide Model from reading and writing data stored in the Access database. These issues usually result in an error containing the term **ODBC**. Two example ODBC error messages are shown below.

Repeating Problem

We have noticed this problem re-occurring when Office 365 is automatically updated. Uninstalling and reinstalling the Microsoft Access database engine as described below seems to fix the problem if it re-appears.



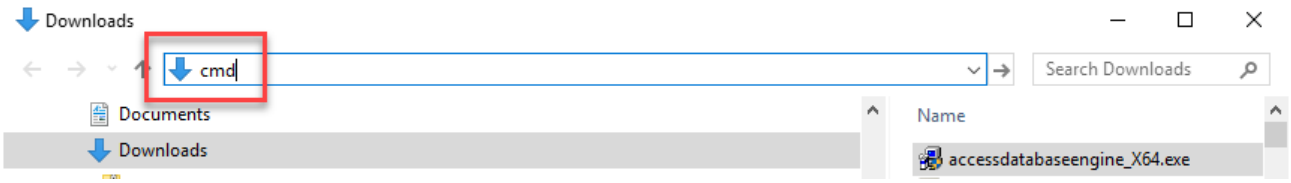


The connection to the Access database can be tested by selecting a model scenario that correctly points to the database, opening the scenario editor, and clicking on the **Year** button on the General tab. If the Access database connection is not working, an error message will be shown at this point.

To correct ODBC errors, the following steps are recommended. These may require administrator access to the machine.

1. Remove any Microsoft Access database engine installations:
   a. In the Settings app, go to the **Add or Remove Programs** or **Apps & Features** screen.
   b. Search for any program having **access** in the name.
   c. Remove any entries containing **Microsoft Access database engine** in the name.
2. Install the Microsoft Access database engine.
   a. Download the installer from Microsoft at: https://www.microsoft.com/en-us/download/details.aspx?id=54920
   b. Most users should download and install the 64-bit version, but users of 32-bit TransCAD will need to install the 32-bit version.

c. Start a command prompt in the directory where the .msi file is downloaded. This can be done by typing **cmd** in the address bar from a File Explorer window showing the directory with the .msi file and then pressing **enter**.



d. In the command prompt that appears, type one of the following commands:

```
accessdatabaseengine_X64 /quiet      ← for 64-bit
accessdatabaseengine /quiet          ← for 32-bit
```

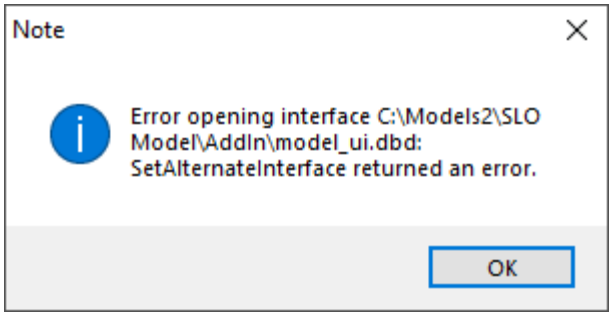
e. Review any security/administrator prompts and approve if acceptable.

f. Close the Command prompt window upon completion.

3. Open TransCAD and attempt to reproduce the error. If the error still occurs, try rebooting the system.

A.2 Error Opening Interface

After installing the model, the error shown below is sometimes encountered.



This can occur when the model is sent over the internet in a zip file. When extracting the zip file, file dates can be set to the current date and time, causing a date consistency check in TransCAD to fail.

If files are transferred directly over a file transfer service such as DropBox or OneDrive without zipping them, dates may be changed and cause this error to appear. In this case, the sender may need to zip the files and re-send.

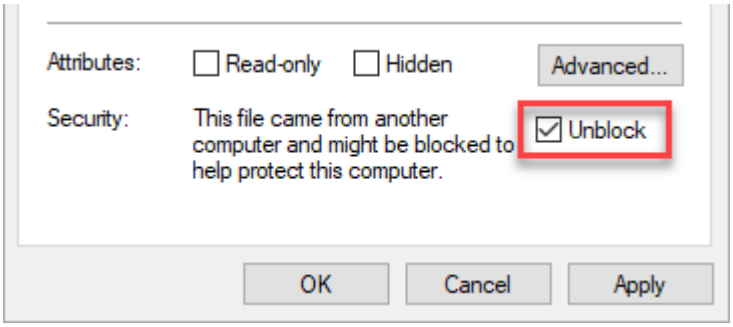
Two potential solutions to this problem are described below.

1. Ask the sender to use the 7-zip software, available at https://www.7-zip.org/ to compress model files into a 7-zip file. Then, use the 7-zip software to extract the files. This will usually prevent file dates from being changed, correcting this error.

2. If files are only available in a zip file, or if the dates are still changed when using 7-zip, the following steps may help.

   a. Right-click on the zip file and choose **Properties**.

   b. Near the bottom of the Properties dialog, check the **Unblock** option.



   c. Click OK.

   d. Try extracting the files and running the model again.