

# **A Manual for the Tranplan - MapInfo Modeling Environment**

## **A.1 Introduction to Tranplan - MapInfo Modeling Environment**

Welcome, this documentation demonstrates operation of the integrated Tranplan - MapInfo environment. Goals of the environment are to allow users to tap into the power of geographic information systems (GIS) and provide additional tools in an effort to increase the power of a specific travel model software. The software packages in this document include Tranplan (UAG) and MapInfo (MapInfo Corp.). This manual documents the incorporation of an existing Tranplan model into MapInfo, then proceeds step wise through the operations required to perform a model run, analyze results, and make network modifications within the GIS environment.

This manual begins with documentation of the initial requirements for operating the environment. The node, link, and production/attraction files need to be stored as individual files. All of the data in these files needs to be in the correct columns as required by Tranplan. If this information is not available in existing ASCII files, running NETCARD on a binary network file and saving the individual data elements as new files or cutting and pasting from the \$Build Highway Network control file will create the necessary input files.

Another requirement is that all files need to be stored in one subdirectory. When developing multiple scenarios, it is recommended than each new scenario be stored in a separate subdirectory. To make operation of the programs easier, each of these subdirectories should contain copies of the programs. This is not a requirement, it is possible to have all the programs stored in one directory, however, the user would need to copy all the required files to this directory when operating the environment, introducing the potential for user error.

Another requirement is knowledge of the total number of zones in the network. This information needs to be known to operate some of the programs. In addition, knowledge of the names entered in the Tranplan control files (filename for the productions and attractions, outfile for the \$Build Highway Network control file, and names of tables within MapInfo).

The final required item is knowledge of the projection system used to develop the network. Running the registration programs requires the projection system to place the network in the correct place on the earth. Correct placement is required to allow for overlay of other data sets. If no coordinate system was used to develop the network, then the user can proceed by entering an x-y coordinate system (avoid using Lat-Long).

Required files - all should be placed in one subdirectory:

Tranplan files: USER PROVIDED

Node file - a file containing the node data, cannot be titled NODES.TXT

Link file - a file containing the link data, cannot be titled LINKS.TXT

Production and attraction file - a file containing the Ps and As for the centroids (maximum of five trip purposes)

External trip file - a file containing the external trip table for use in Tranplan

Friction factor file - a file containing the friction factors for use in Tranplan

FILES AVAILABLE FROM CTRE/ISU (<http://www.ctre.iastate.edu/fhwa/download.htm>)

DOSXSMF.EXE - a file required to run FORTRAN programs

TP\_MI.EXE - FORTRAN executable for developing MapInfo tables and maps for node and link information

NETBLD.EXE - FORTRAN executable for developing a Tranplan control file to build the initial network in Tranplan.

LOADED.EXE - FORTRAN executable for stripping out unnecessary information from output of Tranplan

URNS-F.EXE - FORTRAN executable for developing the turning movement table

S-PATH.EXE - FORTRAN executable used to developed the shortest path

MODEL.MBX - MapBasic program which operates the modeling environment

AMES\_EXT.DAT - The external trip table for the Ames network

FRICITION.DAT - The friction factors for the Ames network

LINKS.DAT - Link file for the Ames network

NODES.DAT - Node file for the Ames network

GM.PA - Production and attraction file for the Ames Network (79 zones)

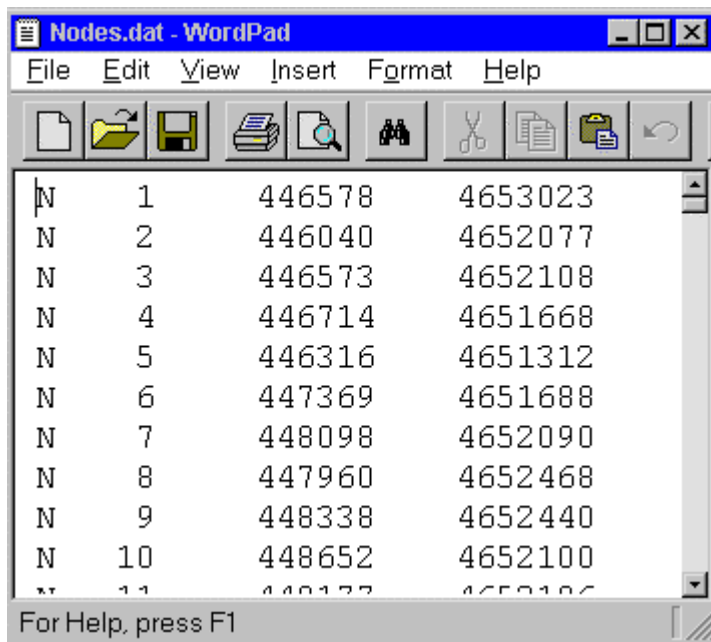
MODEL.IN - Tranplan control file to run everything except the \$Build Highway Network

## A.2 Register an Existing Tranplan network into the MapInfo Environment

This section contains a narrative description of registering the network into MapInfo. The goal is to bring the existing, unloaded, Tranplan network into MapInfo. This operation will develop a base network for the area, with new scenarios being developed as modifications of the original network.

**Step 1.** The initial step is the collection of the required files, node, link, production and attraction. These files should be placed in the directory where the scenario is to be developed. Other files that should be placed in this directory are the executable files required by the environment and the files required to perform a Tranplan run.

The three required files (link data, node data, and production and attraction data) need to be stored in separate files in the appropriate Tranplan format. Examples of the three files are shown:



Node ID	Node X-coordinate	Node Y-coordinate	Node ID
N 1	446578	4653023	
N 2	446040	4652077	
N 3	446573	4652108	
N 4	446714	4651668	
N 5	446316	4651312	
N 6	447369	4651688	
N 7	448098	4652090	
N 8	447960	4652468	
N 9	448338	4652440	
N 10	448652	4652100	

Node file.

Links.dat - WordPad

File Edit View Insert Format Help

1002	10030	8085500	0	012	0	0	10900	085500	0	0	0	0	10900	0
1003	10040	6985500	0	013	0	0	9000	085500	0	0	0	0	9000	0
1005	10060	25585500	0	073	0	0	26000	085500	0	0	0	0	26000	0
1006	12560	15486500	0	073	0	0	26000	086500	0	0	0	0	26000	0
1254	10080	8784500	0	011	0	0	12000	084500	0	0	0	0	12000	0
1008	10090	32185500	0	011	0	0	12000	085500	0	0	0	0	12000	0
1010	10110	27785500	0	073	0	0	26000	085500	0	0	0	0	26000	0
1013	10140	17986500	0	011	0	0	12000	086500	0	0	0	0	12000	0
1004	10150	4985000	0	012	0	0	10900	085000	0	0	0	0	10900	0
1015	10160	2885000	0	012	0	0	10900	085000	0	0	0	0	10900	0
1016	10170	7885000	0	012	0	0	10900	085000	0	0	0	0	10900	0
1017	10180	8384000	0	012	0	0	10900	084000	0	0	0	0	10900	0
1017	10190	8184000	0	012	0	0	10900	084000	0	0	0	0	10900	0
1004	10200	1984500	0	063	0	0	24000	084500	0	0	0	0	28000	0

For Help, press F1

NUM

Link file.

Gm1996.pa - WordPad

File Edit View Insert Format Help

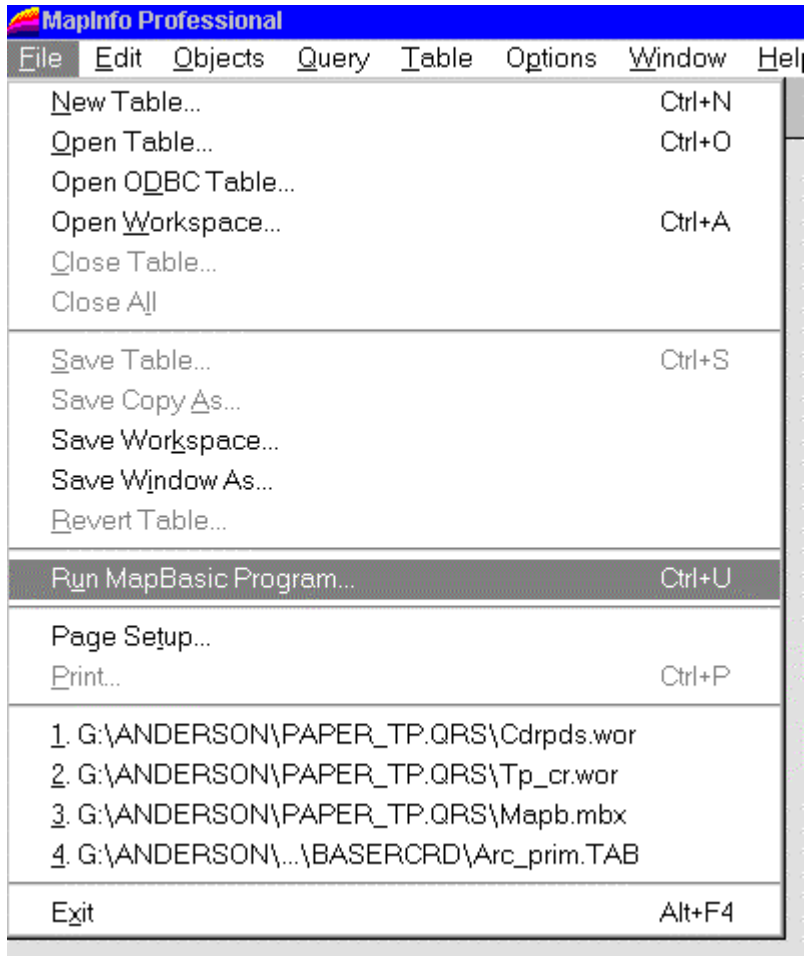
GP	1	1	0	0	5824
GP	2	1	386	1289	2352
GP	3	1	652	2167	1465
GP	4	1	534	1479	228
GP	5	1	793	2936	707
GP	6	1	0	0	723
GP	7	1	410	1241	151
GP	8	1	150	453	47
GP	9	1	126	381	251
GP	10	1	0	0	1181
GP	11	1	156	512	2454
GP	12	1	754	2475	1328
GP	13	1	9	29	1612
GP	14	1	844	2431	143
GP	15	1	90	285	3110

For Help, press F1

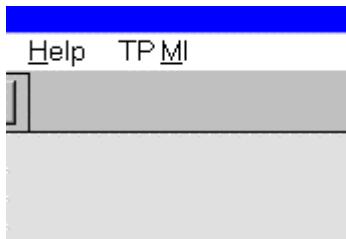
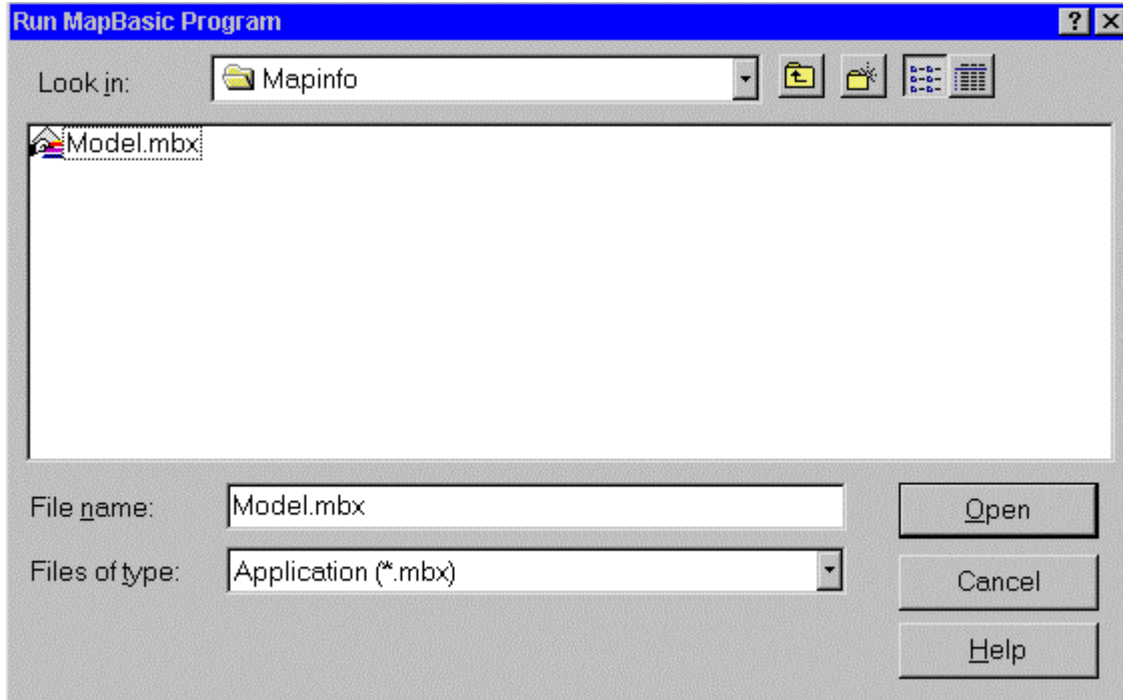
NUM

Production and attraction file.

**Step 2.** After the files are gathered and placed in the appropriate directory, the user should enter MapInfo run the MapBasic program written to operate the environment. The MapBasic program is run by selecting the FILE - RUN MAPBASIC PROGRAM option from the menu.

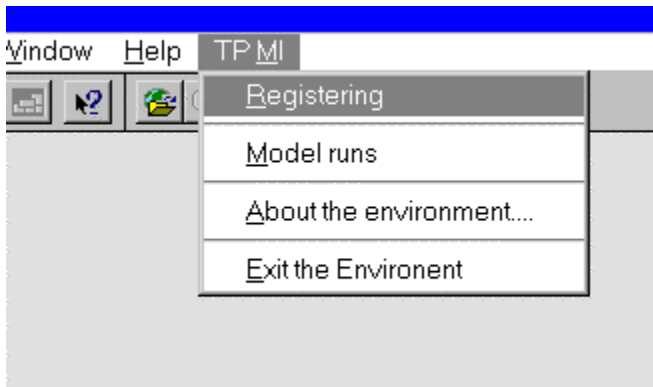


A new window will appear, in this window, change the directory to the appropriate directory where the files are stored and the file MODEL.MBX should appear. Either double-click the file name or select and press O.K. will start the program. After starting the program, a new menu item should appear at the top of the screen after the Help menu.



Example of the new TP\_MI pull down menu.

**Step 3.** After the new menu is created, the network will be registered after selecting TP\_MI - REGISTERING.



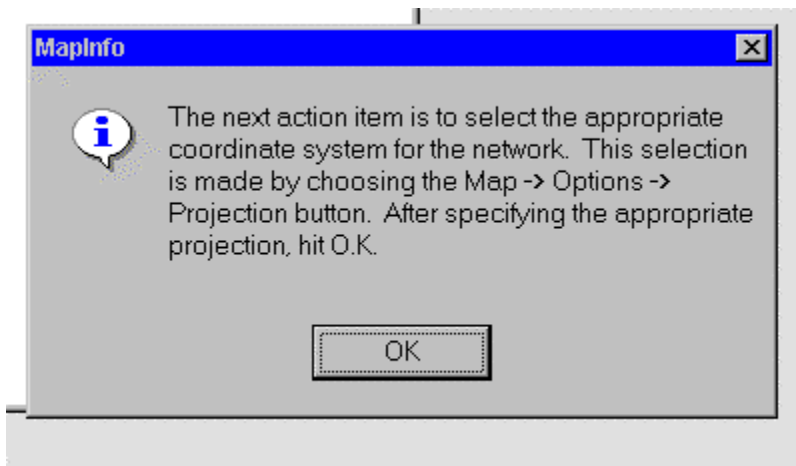
This option produces a dialog box, which informs the user the first step in registering the network is running the Fortran program called TP\_MI.EXE. Selecting O.K. will call a DOS window, where in the appropriate directory, the user needs to type TP\_MI at the prompt. This program will ask the user a few questions about the model and will read in the appropriate data from the files to create MapInfo tables from the data. The questions the user will be asked are:

1. enter the name of the file containing the node data
2. enter the name of the file containing the production and attraction data
3. enter the name of the file containing the link data

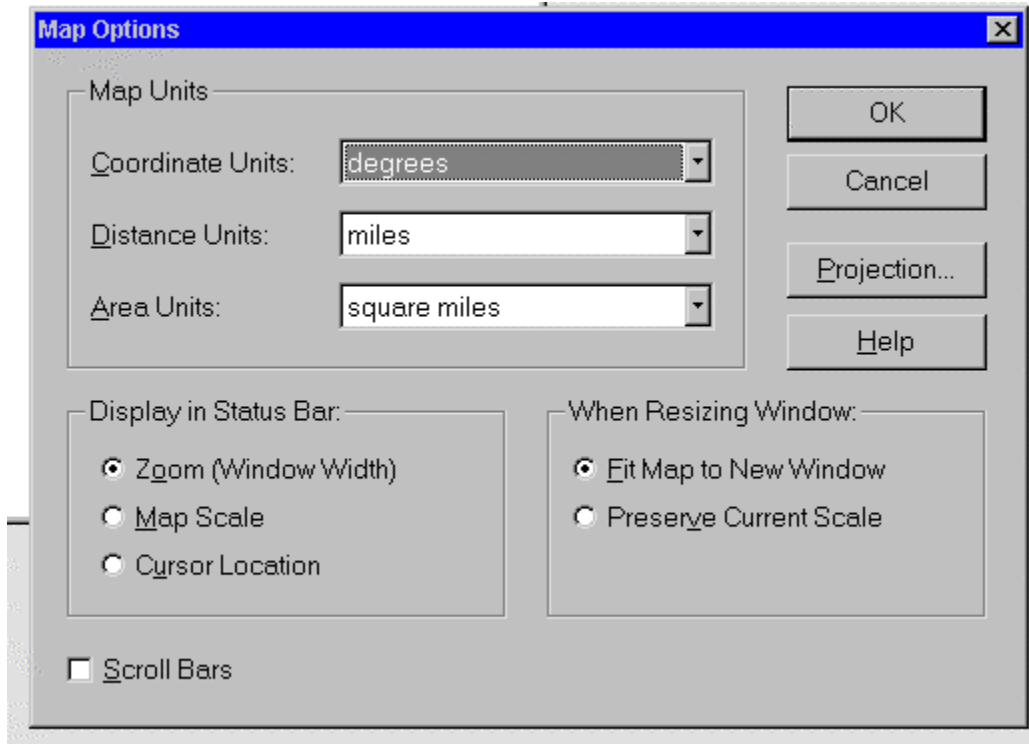
4. enter the number of zones or total number of centroids on the network (any node with production and attraction data associated with it)
5. enter whether or not the coordinates for the nodes need to be factored to align them within a real-world coordinate system
  - if YES, enter the factors
  - if NO, continue
6. enter the appropriate description for the nodes file (small or large coordinates)

The program will then run and read the Tranplan information and re-format the information into an acceptable format for MapInfo to read in the data. This program may take considerable time to run, possibly over an hour depending on hardware and network size. After the program is complete, the DOS prompt will return and the user can continue by typing "exit". This will return the user back to MapInfo where the program will be waiting to continue. Selecting O.K. will then register the node and link information.

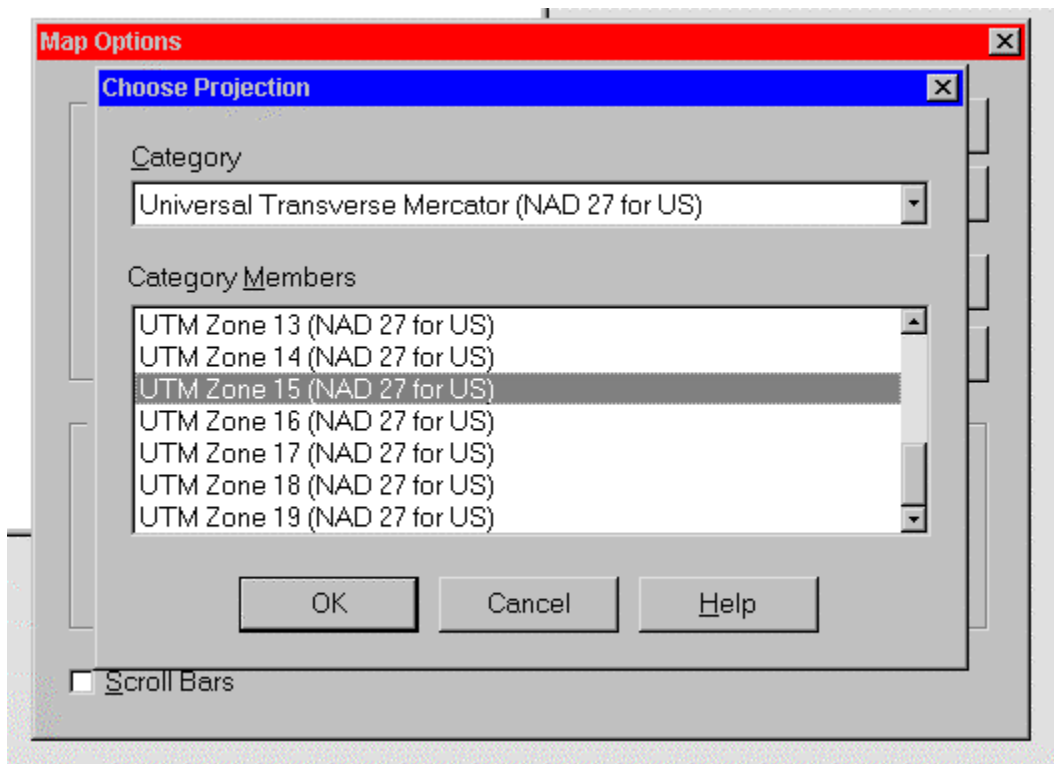
**Step 4.** At this point, MapInfo will be registering the network. The registration process will open and close numerous windows called nodes and links with various extensions (11, 1Z). These files are intermediate files that MapInfo uses. The next action item for the user is to enter the appropriate projection system for the network when prompted to do so by the program.



Pressing the OK button will display a new map option window that has the ability to change the projection system for the map. The user needs to select the projection button from the dialog box.



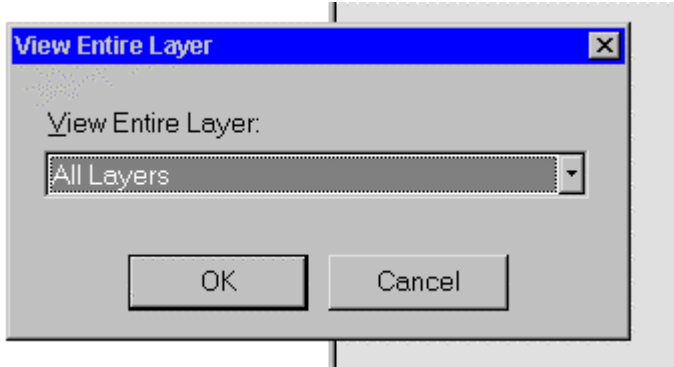
Selecting this option will display a new dialog window with all the available MapInfo projections.



In the example, the Tranplan network was developed in UTM NAD 27 and Zone 15 for the US. (This is the case for the Ames network.)

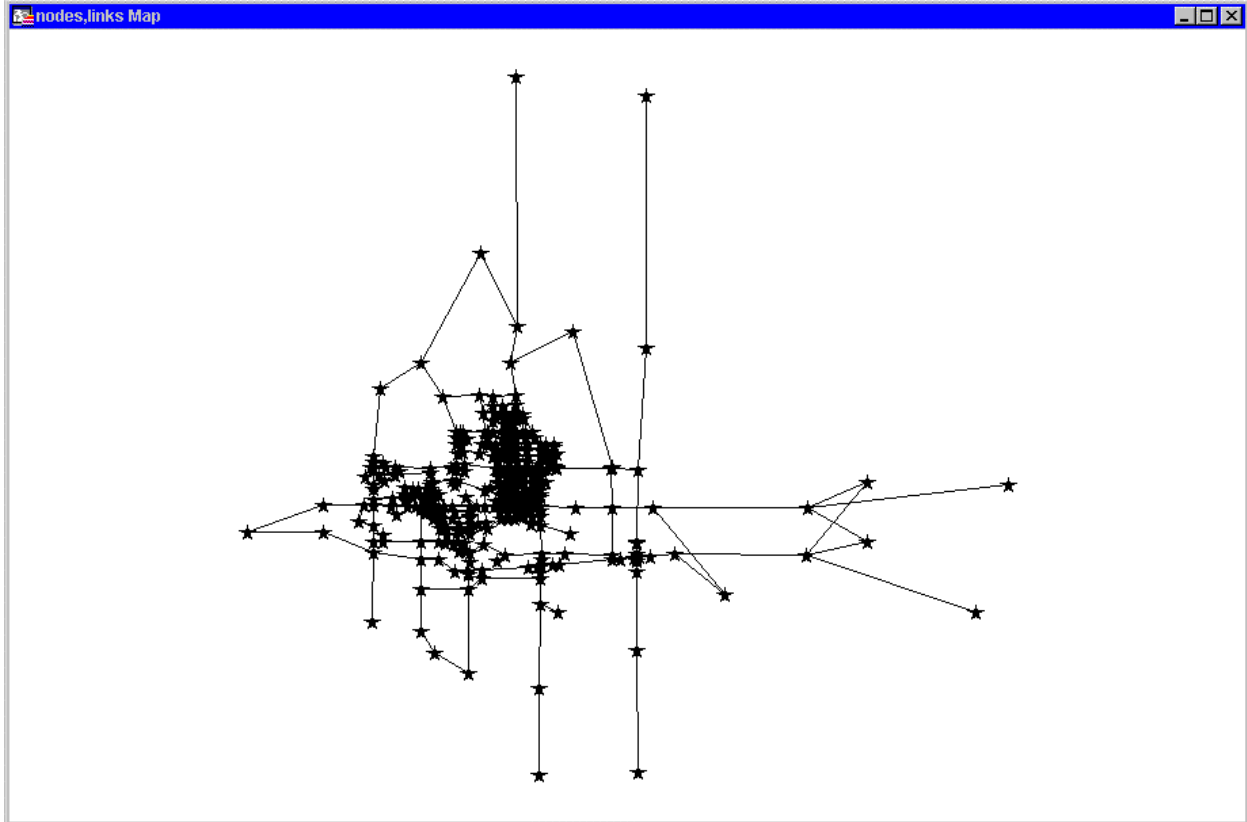
The user continues by selecting the appropriate coordinate systems and selects the OK button to cause the program to continue running.

**Step 5.** The program will then create the linework for the network. After creating the linework, the program will ask if the user would like to view the entire layer.



After viewing the network, the program will continue to register the network and will change the name of the file to nodes.tab and links.tab. These files are the node and link file for the network. After this step, the network will be completely registered in MapInfo and ready to be routed through Tranplan.





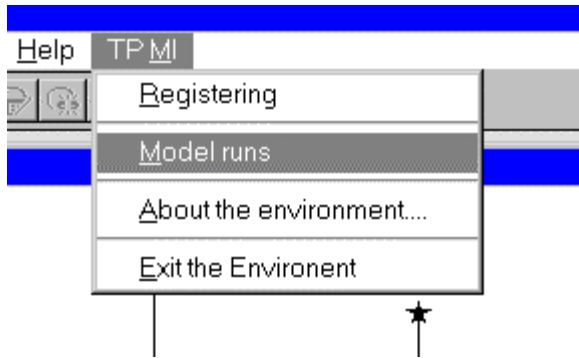
After completing the registration process, the network will be completely incorporated into MapInfo. At this phase, it is possible to perform a Tranplan model run or, if desired, make changes to the model and perform a model run.

### ***A.3 Performing a Model Run of the Tranplan Network***

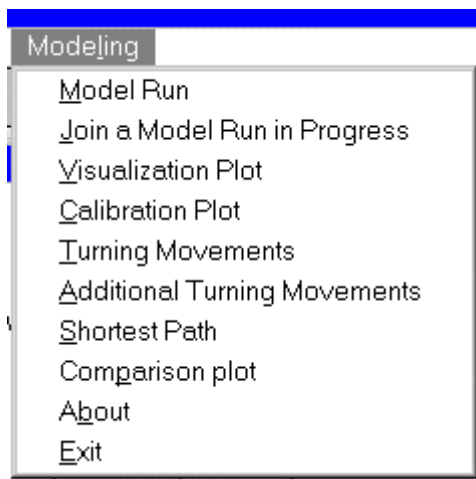
If modifications are desired, the next section describes requirements and suggestions to performing the modifications. To make a modification, a copy of the nodes and links should be made and stored in a separate directory. The process needed to make the copy of the table is to select the **SAVE COPY AS** command from the **FILE** menu. The selection of this command will prompt the user to select the table to have the copy saved as and prompt the user to locate the table and rename the table something different from the original table.

After the table has been saved, the existing table should then be closed and the new table opened. The new table will not be editable until selecting the **LAYER CONTROL** option from the **MAP** menu and then highlighting the particular layer to be edited and then selecting the editable box in the right side of this window. After this is done, the map and table may be edited. Possible modifications include changing the production and attraction values associated with each centroid, changing link attributes (speed and capacity), and the addition or deletion of new nodes and links to the network. Once the modifications have been made the analyst is ready to determine the new loaded speeds and volumes.

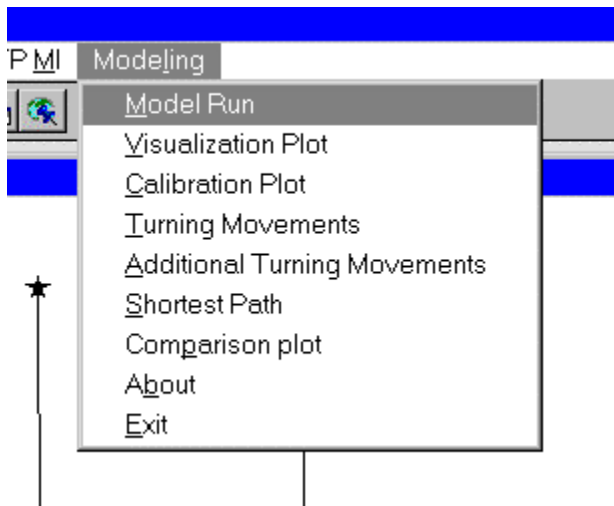
To perform a Tranplan run, The user needs to select the **MODEL RUNS** item from the **TP\_MI** Menu bar.



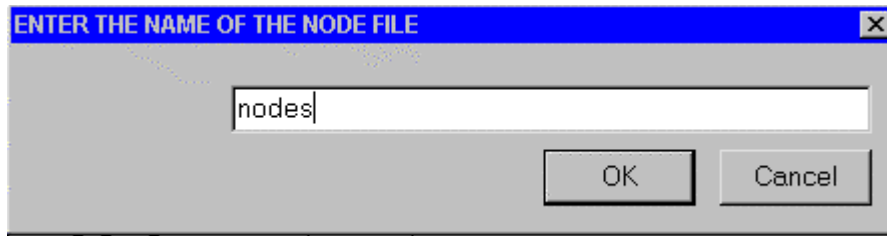
This item will activate a new menu item titled MODELING and open a new button pad containing all the features of the menu bar. Included in the menu bar are items to perform Tranplan runs, create visualization and calibration plots, display the turning movements at intersections, and a shortest path visualization tool.



Selecting the MODEL RUN menu will start the algorithm for performing model runs.



This first item is to identify the names of the node and link tables. The program will display a window where the user needs to type in the name of the link table and then the name of the node table. An example of entering the node table is shown. Note that the extension need not be entered in the window.



The program will export the data contained in these tables and place them in a format to be used later. The program will write the information into the files named NODES.TXT and LINKS.TXT, therefore, it is important the user not use these filenames because they will be overwritten. The program will also prompt the user as to whether the turns table is open or not. The user is required to click the mouse on the appropriate button. If open the program will close the table.

The program will display a message informing the user that the next step is to run a Fortran program. After the user clicks the OK button, the program opens a DOS window where the user needs to run a FORTRAN program to create a Tranplan input file to build the highway network. The program to be run is titled NETBLD.EXE and can be run by typing NETBLD at the prompt. This program will ask the user some questions related to the network and the names of the Tranplan input files and the file used to connect the \$Build Highway Network module to the remaining Tranplan functions:

1. Enter the name of the Tranplan control file to build
2. Enter the number of characters in the file connecting the \$Build Highway Network file to the remaining Tranplan functions
3. Enter the name of the file to connect the \$Build Highway Network file to the remaining Tranplan functions
4. Will the production and attraction information be stored as one file or two files
  - if 1, enter the filename
  - if 2, enter the filename for the productions
  - enter the filename for the attractions
5. Enter the number of TAZs or zones in the network
6. Enter if a turn prohibitor file will be included with the network
  - if Y, enter the filename

Performing these steps will create the Tranplan control file that will be run for the \$Build Highway Network portion of the model run.

After running the program, the user types exit at the DOS prompt to return to MapInfo. The user needs to select the OK button and a Tranplan window will open. This window is where the user will run the Tranplan control files. The first file to be run is the \$Build highway network input file that was created in the Fortran program previously run. After running the \$Build highway network control file, the user needs to run the other control file containing the remaining Tranplan functions.

After running Tranplan, the user selects exit from the Tranplan screen and will be returned to MapInfo. Selecting OK will open a Tranplan Utilities menu, which is used to run the NETCARD and TURNS utilities. The Tranplan module, NETCARD, will convert the binary file into a text file for further use. The NETCARD options to specify include:

- Enter whether speed should be output rather than time - enter Y
- Enter the speed factor - enter 1
- Do you want the capacity 2 field in the capacity 1 field - enter N
- Do you wish to average the BPR iterations (if prompted) - enter the appropriate information for your specific network

Enter one-way format option - enter N

Enter whether you wish header information - enter Y or N depending on use preference.

If prompted for the file to contain the node information (for nodes not connected to links) - enter n.dat or equivalent filename.

The Tranplan utility TURNS will create a file containing the turning movements for the nodes specified in the save turns item in the loading module. The options required are the counts should be associated with the through node, or selecting option B.

Enter the input from Tranplan - equivalent to the output from the Load Highway Network module

enter the output filename - TURNS.TP

enter the node to use - B

Once these two utilities are run, exit netcard and return to MapInfo where the user will be prompted to run two more Fortran programs. The two programs are titled LOADED.EXE and TURNS-F.EXE. These programs can be run by typing loaded or turns-f in the appropriate directory at the DOS prompt. The inputs to the programs are:

#### **LOADED.EXE**

1. Enter the name of the output file from Tranplan's Netcard utility
2. Enter the number of characters in the link table
3. Enter the name of the link table

#### **TURNS-F.EXE**

1. Enter the name of the output file from Tranplan's Turns Utility

After running the programs, type "exit" and return to MapInfo.

Once back in MapInfo, the loaded network information and the turning movement data (if the turns module was run and the turning movements were saved) will be incorporated into the existing network. The new speeds and volumes will be inserted into the link table, and the program will calculate items such as the total loaded volume, traffic difference, percent difference in traffic counts, travel times, and volume to capacity ratios.

L6:	0
capacity3:	23,000
capacity4:	3,695
U:	
ID:	1086 1087
total_loaded_volume:	7,401
traffic_counts:	0
traf_diff:	7,401
Traf_diff_pct:	0
Loaded_volume_1000:	59.208
Travel_time:	1.14989
vc_ab:	0.16113
vc_ba:	0.160652

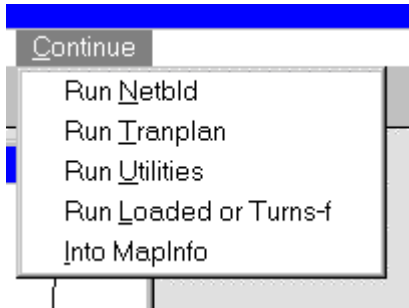
<< >> List Links

welcome to th

The program also opens the turns table containing all the turning movement counts for all the nodes in the network

that the Tranplan model requested to have the nodes saved for. This table will be used to run the turning movement program. If no turns were saved, this part of the program will be skipped.

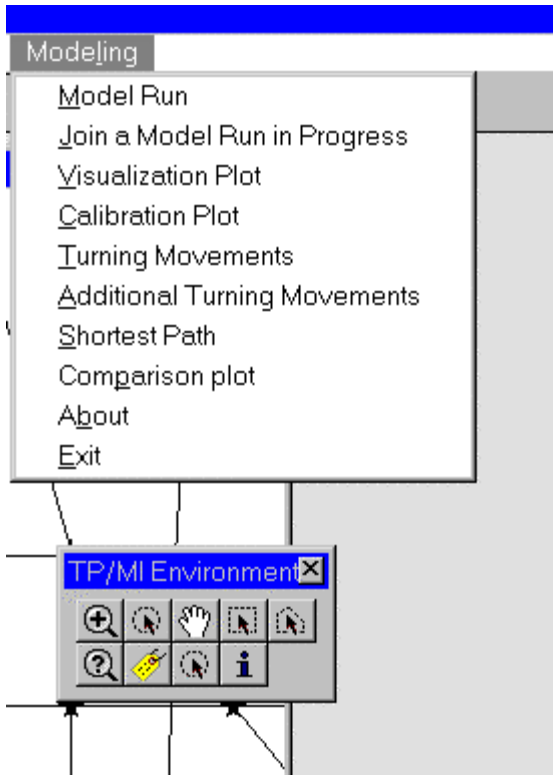
A feature of the MODEL.MBX program is the ability to allow the user to begin anywhere in the process if a problem is encountered. To use this option, the modeling pull-down menu has the option of JOINING A MODEL RUN IN PROGRESS. Selecting this item will introduce a new menu with the new starting points.



This menu allows the user to restart a model from any of the above locations. This uses the assumption that any step already performed will not need to be run again. In this fashion, if the user experiences a problem while performing a model run, the user can start the MODEL.MBX program again and continue from the point where the operation stopped (after correcting the problem). This allows the user more flexibility when it comes to performing model runs.

#### A.4 Analysis Options

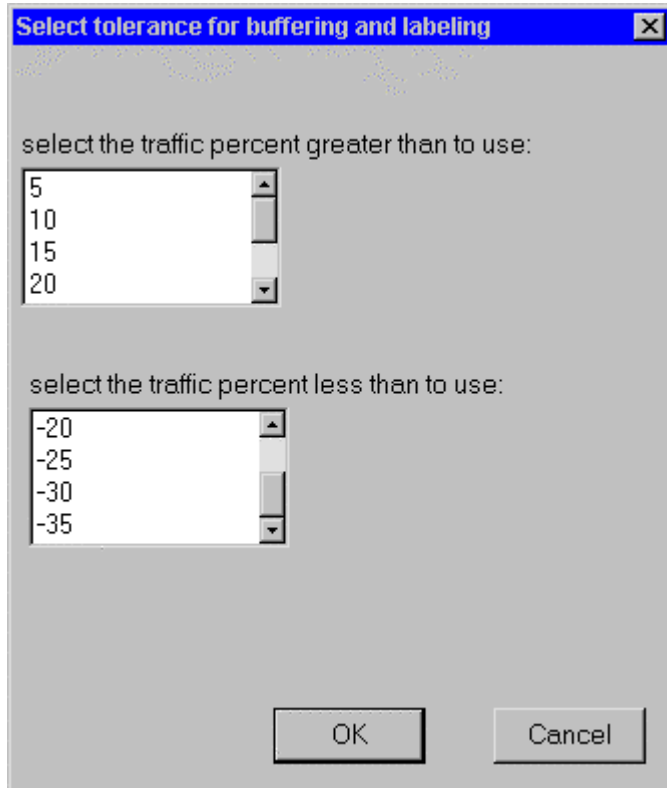
After the program finishes updating tables and opening tables, the user will be able to select any of the other functions available from the MODEL RUNS menu.



### A.4.1 Model Plots

To develop either the visualization or calibration plot for the network, select the appropriate item, VISUALIZATION PLOT or CALIBRATION PLOT from the MODEL RUNS menu. The purpose of the plots is to allow the user to visualize important features of the network quickly. The two visualization plots are intended for improving model validation and displaying the effects of future changes in the network.

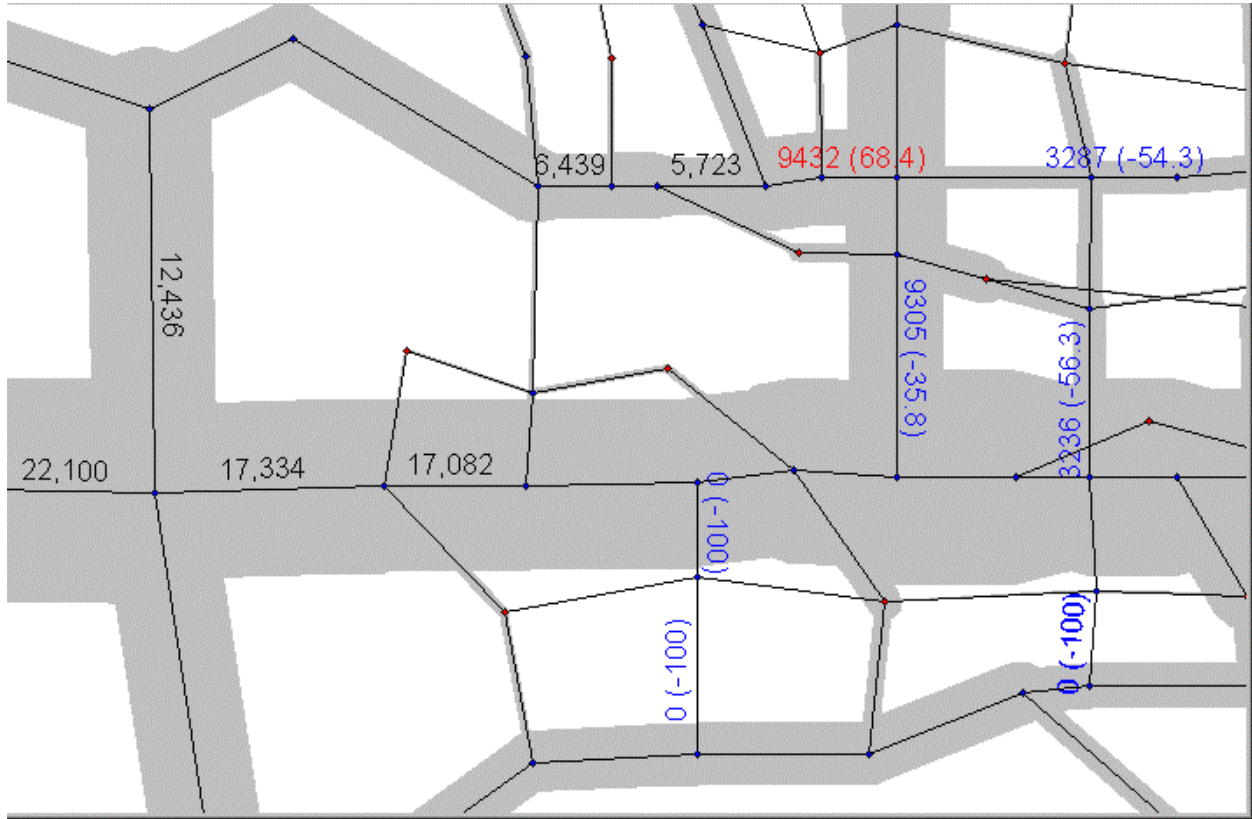
The calibration plot will buffer the network links with the total loaded volume for the link and label the link with the model volume and the difference in model volume and actual traffic count if the difference is greater than the percent the user specifies. The following screen shows the options available to the user (the user can choose anywhere from 5 to 35 percent greater than or less than).



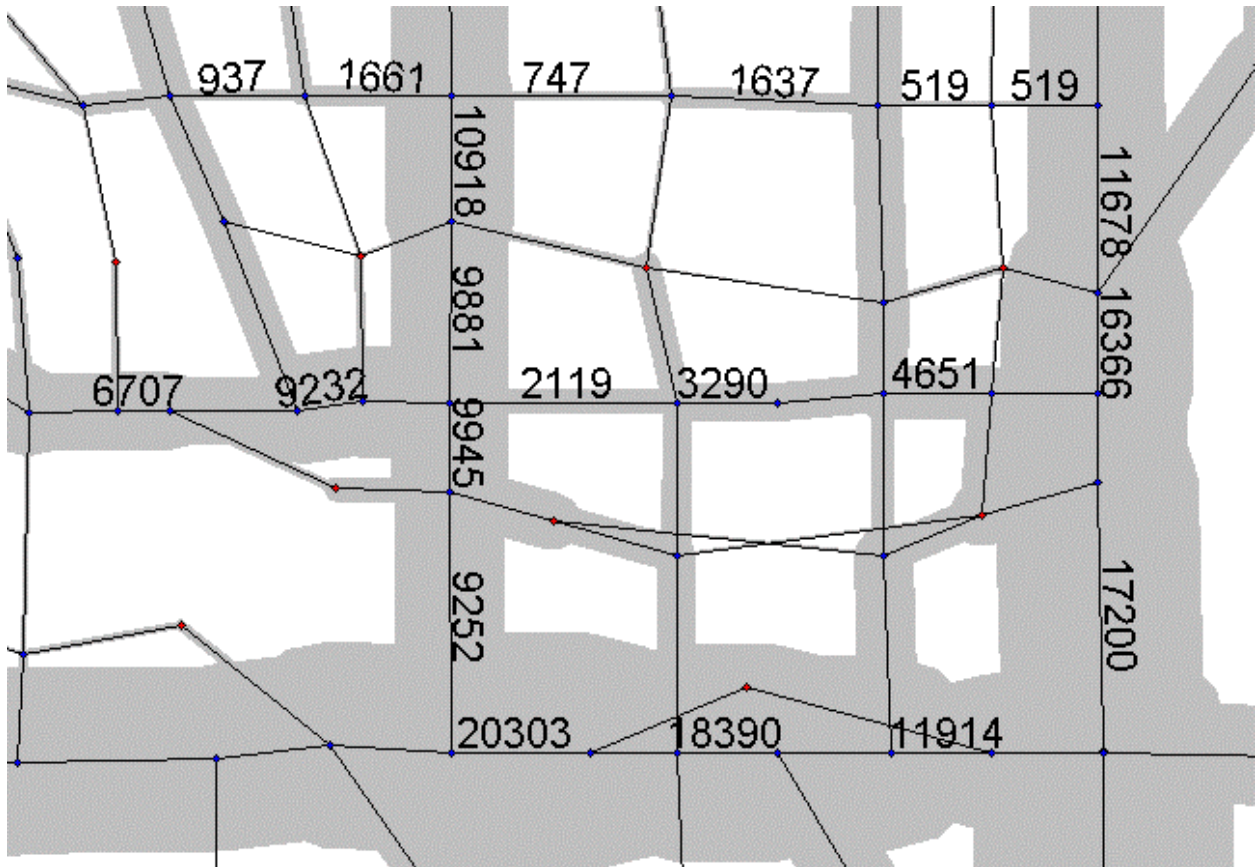
The dialog box has a blue title bar with the text "Select tolerance for buffering and labeling" and a close button (X) on the right. The main area is light gray. It contains two sections, each with a label and a list box. The first section is labeled "select the traffic percent greater than to use:" and has a list box with the values 5, 10, 15, and 20. The second section is labeled "select the traffic percent less than to use:" and has a list box with the values -20, -25, -30, and -35. At the bottom of the dialog are two buttons: "OK" and "Cancel".

Section	Label	Options
Greater than	select the traffic percent greater than to use:	5, 10, 15, 20
Less than	select the traffic percent less than to use:	-20, -25, -30, -35

An example of the calibration plot is shown in the figure.

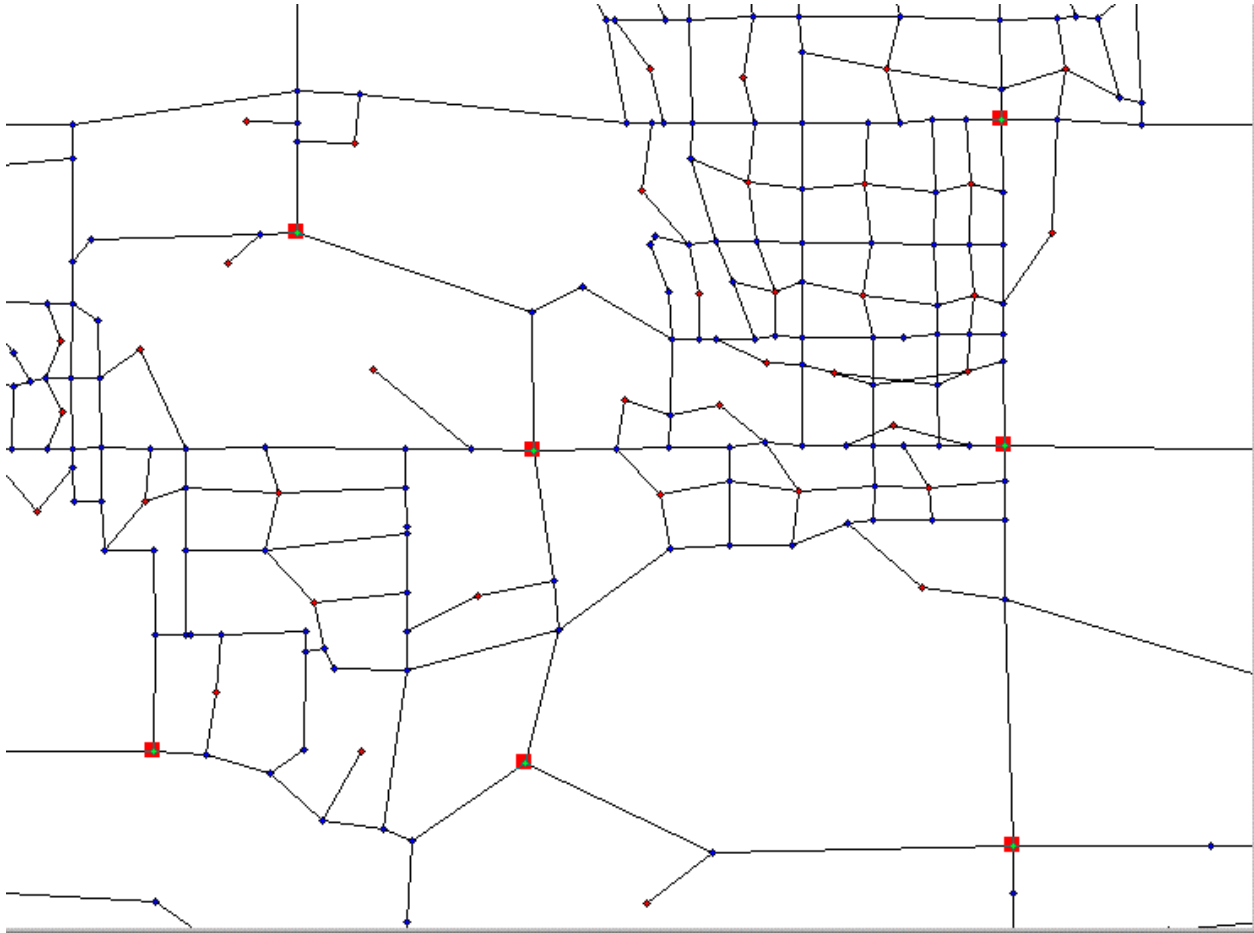


The visualization plot will buffer the links with the total loaded volume and label the links with the Tranplan model volume. An example is shown in the figure.



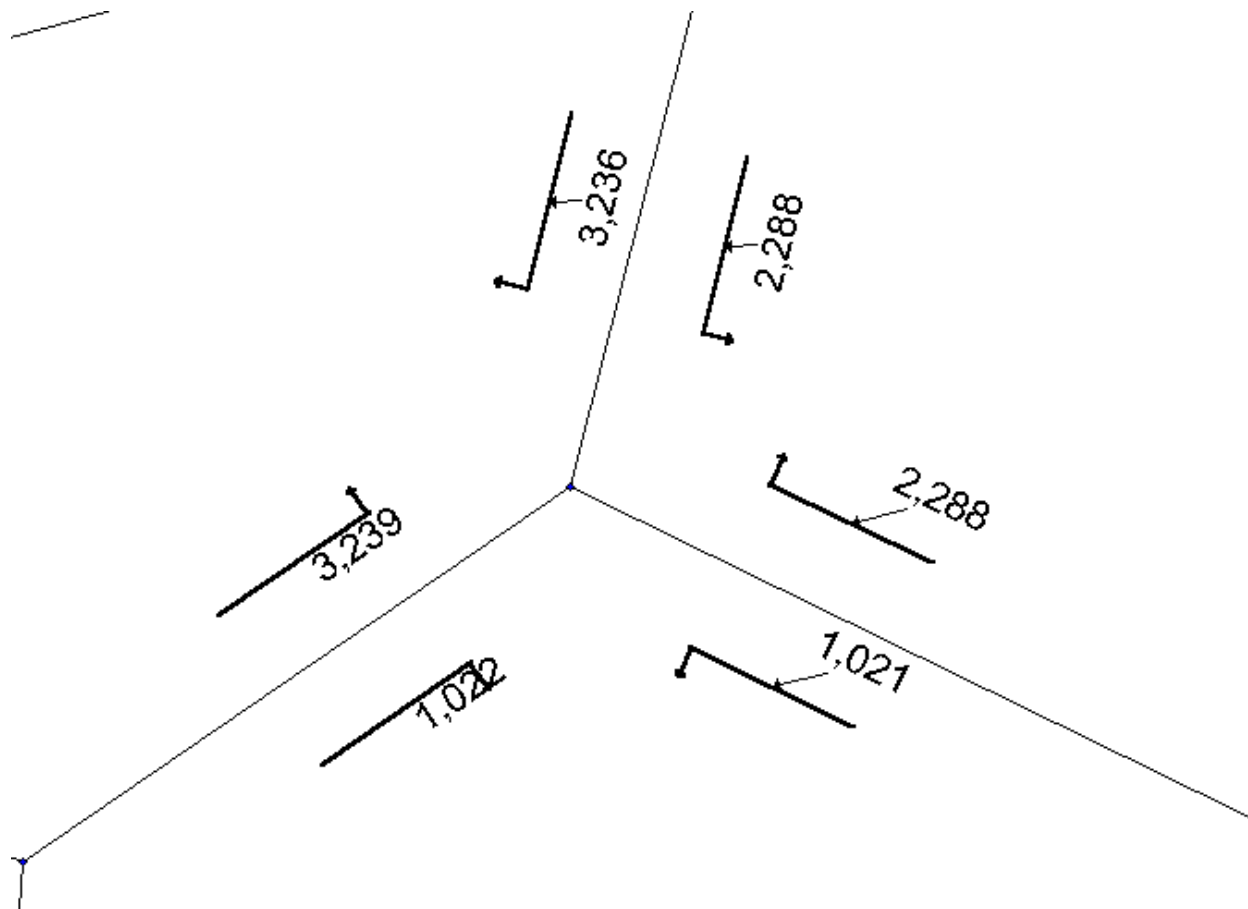
## A.4.2 Turning Movements

To operate the turning movement module, select the nodes where the turning movements are desired.



Then select the **TURNING MOVEMENTS** option from the **MODEL RUNS** menu or select the appropriate button from the button pad. Doing this will display the turning movements for the selected intersections.

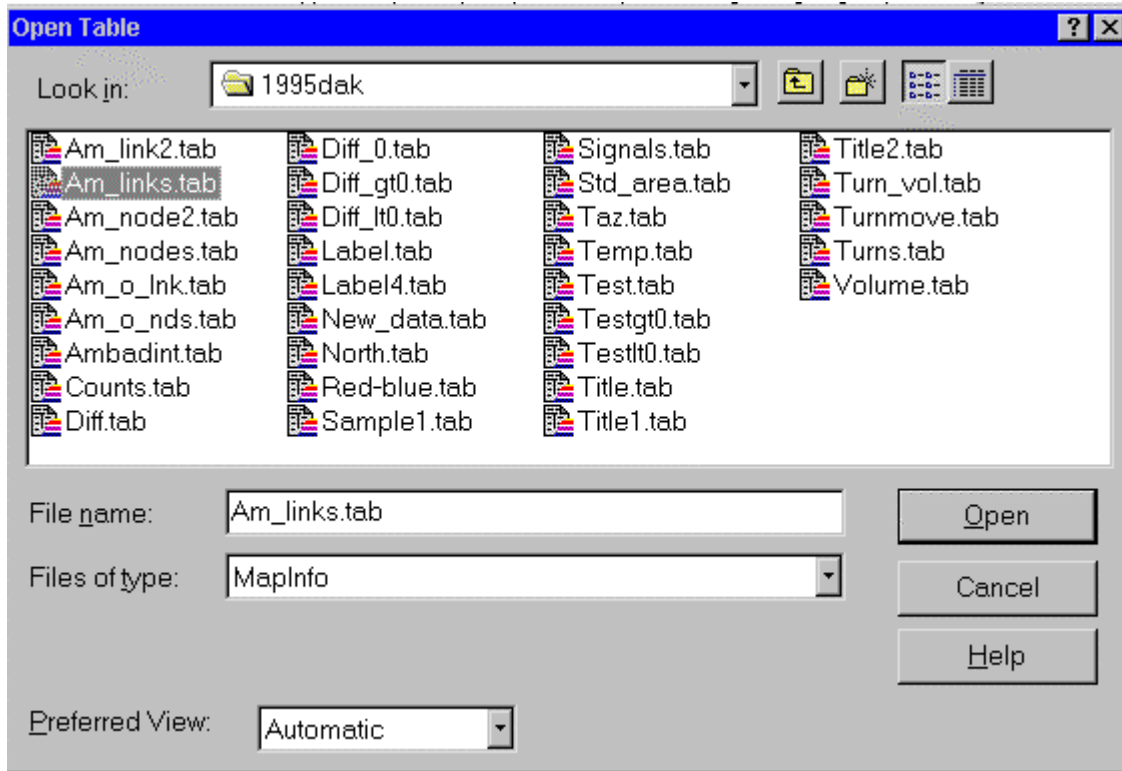




If the desired turning movements are already displayed, and it becomes necessary to display another intersection or two to see the travel patterns, select the new nodes of interest and use the ADDITIONAL TURNING MOVEMENTS menu option to display the turning movements. This option will display the new turning movements.







After identifying the appropriate table, select the OK button. The table will open. If the table has the same name as the original table, MapInfo will ask if it can call the table the original table name with an underbar 2 at the end. After opening the table, the next window to appear is the MapInfo SQL select window. This is where the user needs to identify the information desired.

SQL Select

Select Columns: \*

from Tables:

where Condition:

Group by Columns:

Order by Columns:

into Table Named: Selection

Browse Results

OK Cancel Clear Verify Help

Tables ↓

Columns ↓

Operators ↓

Aggregates ↓

Functions ↓

In this window, the user needs to identify the appropriate query to join the two tables together. Because the program doesn't have knowledge of the desired tables or knowledge of the appropriate column to perform the join to combine the tables, the user needs to insert this information. The appropriate tables are the original link table and the link table recently opened. These tables are identified by the table's pull-down menu.

SQL Select

Select Columns: \*

from Tables: Links

where Condition:

Group by Columns:

Order by Columns:

into Table Named: Selection

Browse Results

OK Cancel Clear Verify Help

Tables  
Nodes  
Links  
Am\_links  
Operators

Aggregates

Functions

After identifying the tables, the next item is to define the where condition to join the two tables. The appropriate condition is to join the tables where the ID column in one table equals the ID column in the other. Specifying the join is performed by identifying the appropriate columns from the column pull-down menu and setting them equal.

SQL Select

Select Columns: \*

from Tables: Links, Am\_links

where Condition: Links.ID = Am\_links.ID

Group by Columns:

Order by Columns:

into Table Named: Selection

Browse Results

OK Cancel Clear Verify Help

Tables ↓

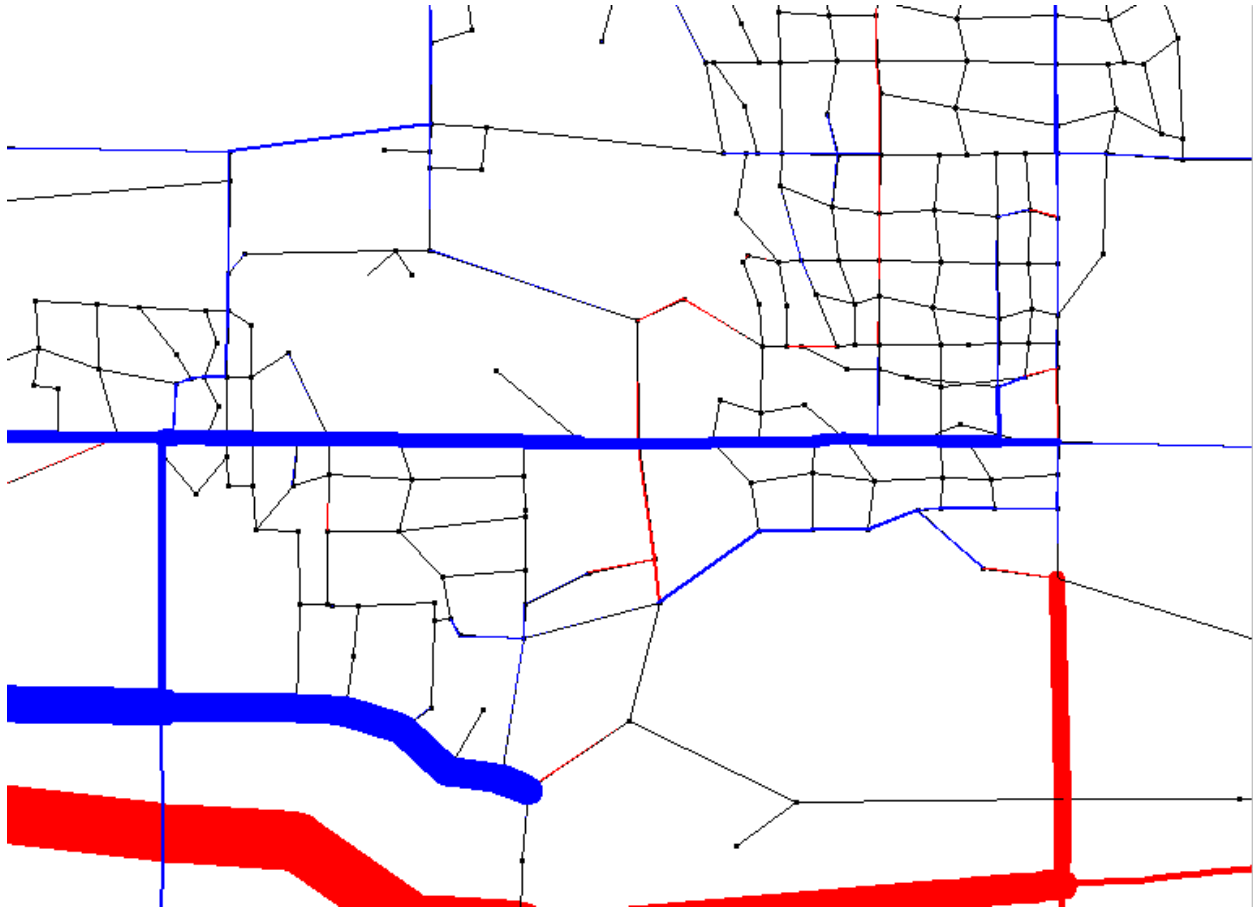
Columns ↓

Operators ↓

Aggregates ↓

Functions ↓

After identifying the appropriate condition for the SQL select, select the OK button. The program will work through a series of tables and create objects for the increases and decreases proportional to the change in traffic expected as a result of the network modification.



Note: this works completely for a change in production and attraction information or a change in link attributes. If there is a difference in the ID column of the links between the two networks, then the program will not work correctly.

This section has described all the features available for network analysis in the Tranplan/MapInfo environment.

## **A.5 Network Modification**

The Tranplan/MapInfo environment has three possible network modifications, which can be made while using the system. The network modifications can represent a change in the land-use (through modification of the productions and attractions), represent a change in link attributes such as speed and capacity (through altering the link attributes), and development or a future year network (through adding nodes and links). Each of these options can be performed within the MapInfo environment and the GIS features of MapInfo are vital in assisting the network modifications.

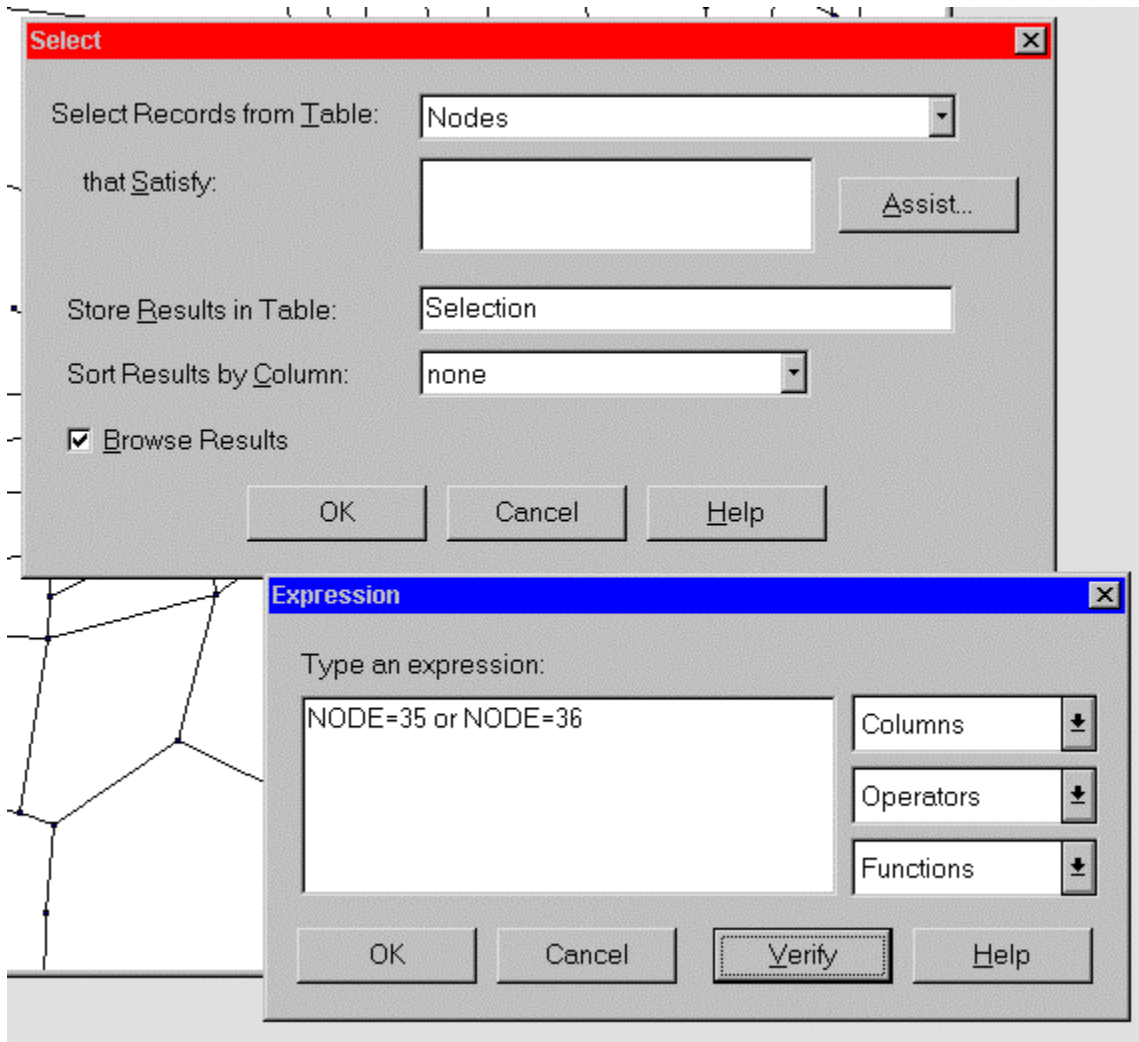
### **A.5.1 Change in land use**

The first scenario to be examined is a change in the land-use of the network. The change can be represented by either a development such as a shopping center that will attract trips, or a residential development that will produce trips, or a combination of both. The Tranplan/MapInfo environment is not equipped with trip generation equation to determine the increase or decrease in productions and attractions associated with a traffic analysis zone. Therefore the user must have the productions and attraction calculated at a different location, either by hand or through the use of a spreadsheet. Once the appropriate productions and attractions are calculated, the user can use MapInfo's selection feature or information pointer to enter the appropriate data.

If the node numbers are known, then the user can use the selection capabilities by performing a select where on the appropriate zone number. Otherwise, the use can perform a graphical selection by using the information tool and selecting the appropriate node from the map window. Either of these operations will display a window showing the attributes for the selected node. Then the user can use the select tool (arrow pointer) and enter the attribute window and type the modified values for productions or attractions.

An example for each type of modification is shown:

For the centroid using the select tool - use the QUERY - SELECT menu option with the nodes table as the table to query from. Then use the where condition to identify the centroids (more than one can be selected at a time). The where condition should identify where the node number is equal to the centroid number. Pressing the assist button will open a new widow with pull-down options to define the query. Note: it is important that the Browse Results is click on.



This will open a new window on the screen displaying the attributes for the selected nodes.

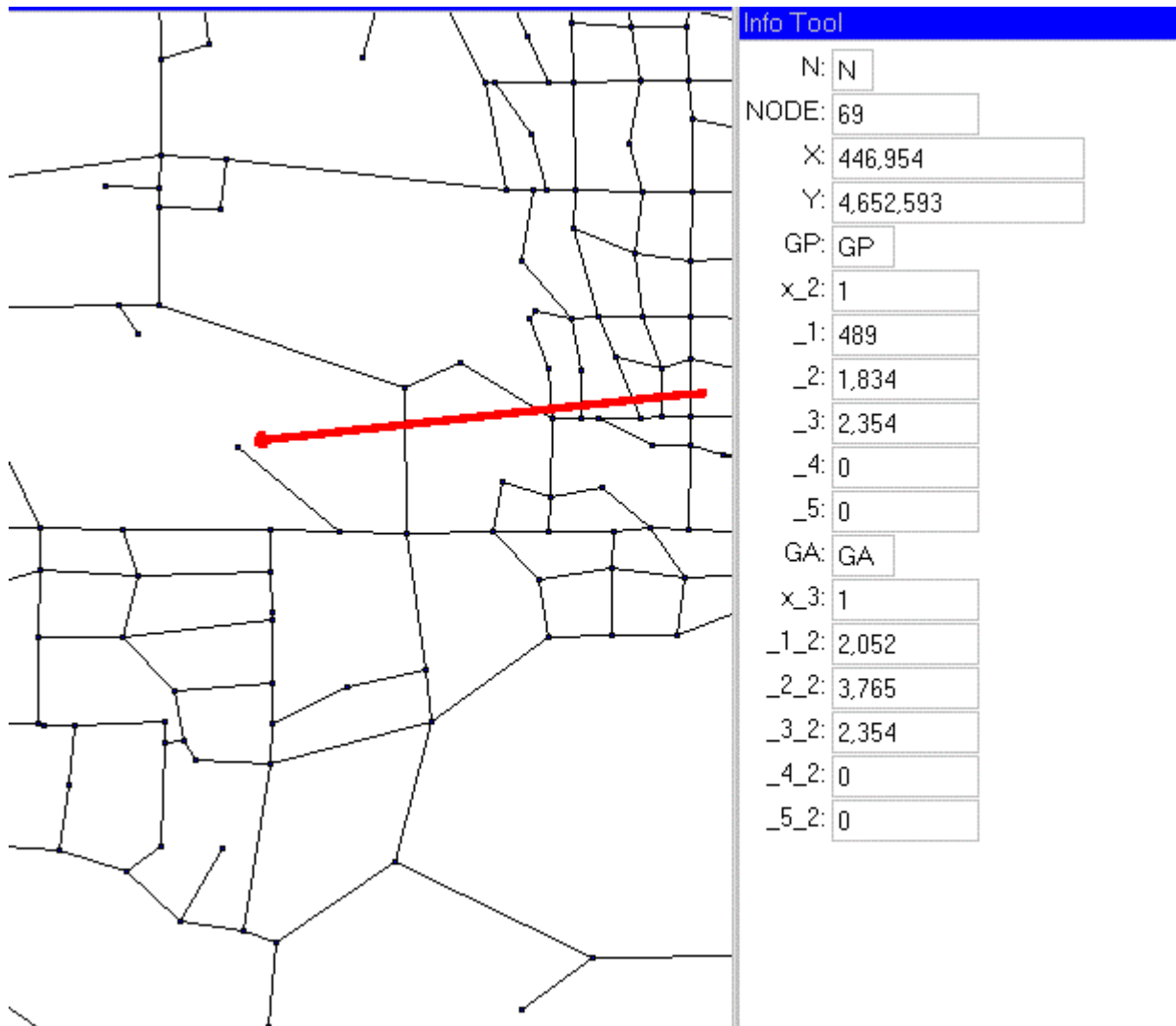
N	NODE	X	Y	GF	x_2	_1	_2	_3	_4	_5	GA	x_3	_1_2	_2_2	_3_2	_4_2	_5_2	
■	N	35	447,572	4,655,434	GF	1	1,162	3,214	258	0	0	GA	1	44	451	258	0	0
■	N	36	448,248	4,655,093	GF	1	495	1,465	163	0	0	GA	1	0	293	163	0	0

Then using the selection tool - arrow pointer - the user can enter the new values for the productions and attractions.

N	NODE	X	Y	GF	x_2	_1	_2	_3	_4	_5	GA	x_3	_1_2	_2_2	_3_2	_4_2	_5_2	
■	N	35	447,572	4,655,434	GF	1	2,000	5,000	500	0	0	GA	1	44	451	258	0	0
■	N	36	448,248	4,655,093	GF	1	495	1,465	163	0	0	GA	1	500	1,500	2000	0	0

As the example shows, the production and attraction values for the two centroids were increased by typing in the new value.

If the information tool is used, take the cursor and select the centroid of interest. This will display a new window showing the attribute information for the selected element. In the example, the arrow points to the selected centroid.



The user then selects the arrow pointer from the main button pad and can edit any of the production and attraction values.

In this fashion, the user can alter the productions and attractions for any centroid in the network and represent any change in land-use through altering these values.

The user should save a copy of the altered table as a new table to ensure that the original information related to the centroid is not lost when developing a new scenario. If the change is intended to represent a permanent change in the network, it is wise to save the table before performing a Tranplan run of the network.

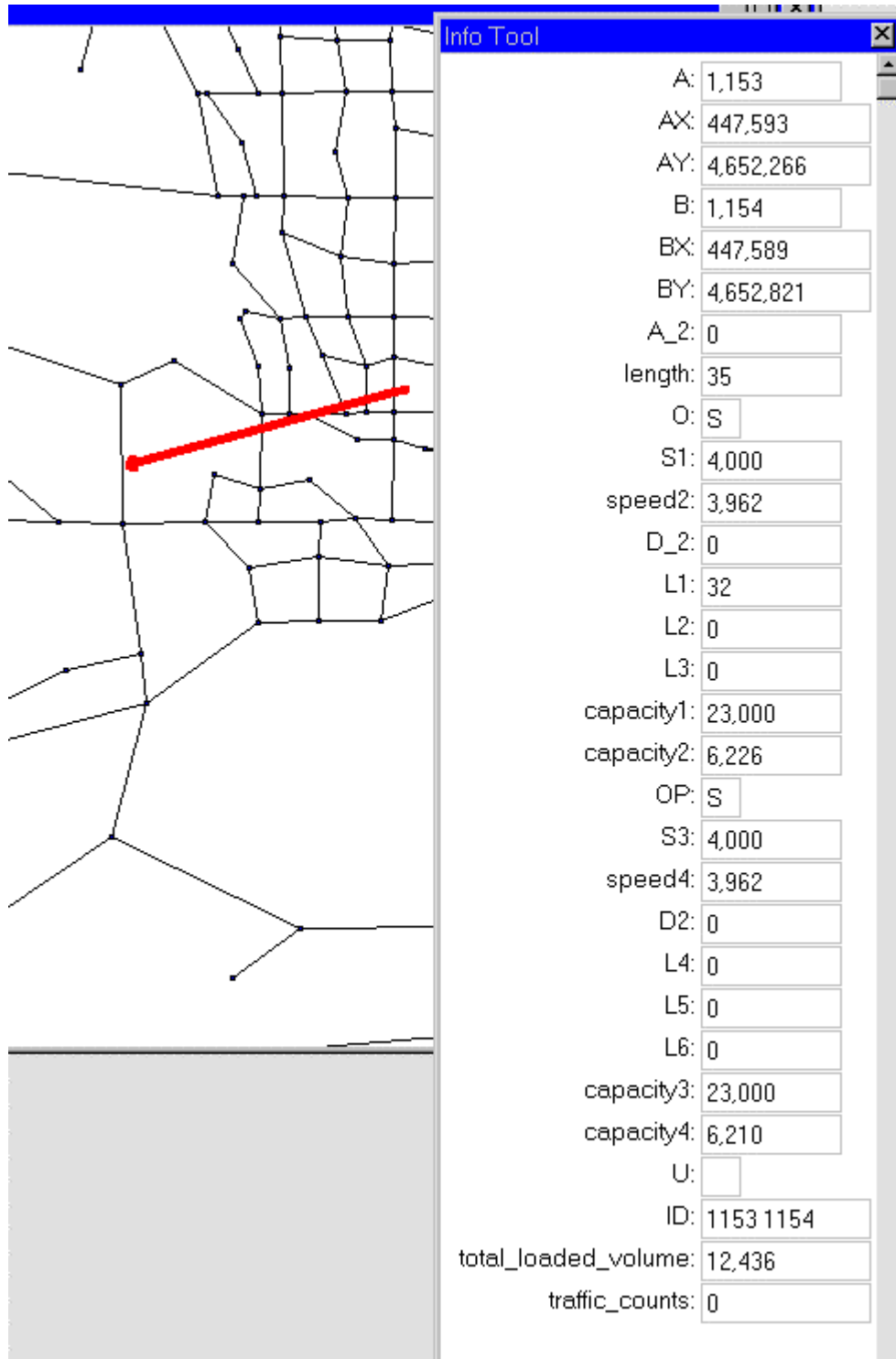
### A.5.2 Change in link attributes

The second scenario to be examined is a change in link attributes. The change can be used to represent an increase or decrease in capacity, modeling the result of adding an additional lane or possible construction limiting the number of lanes available, or an increase or decrease in speed of a lane representing a possible change in roadway usage or representing the effect of a construction project.

There are two main methods available for altering the link attributes: use the information tool if the change is limited in nature or if each link is expected to experience its own change, or perform an area wide selection if a large

number of links are to be changes to the same value.

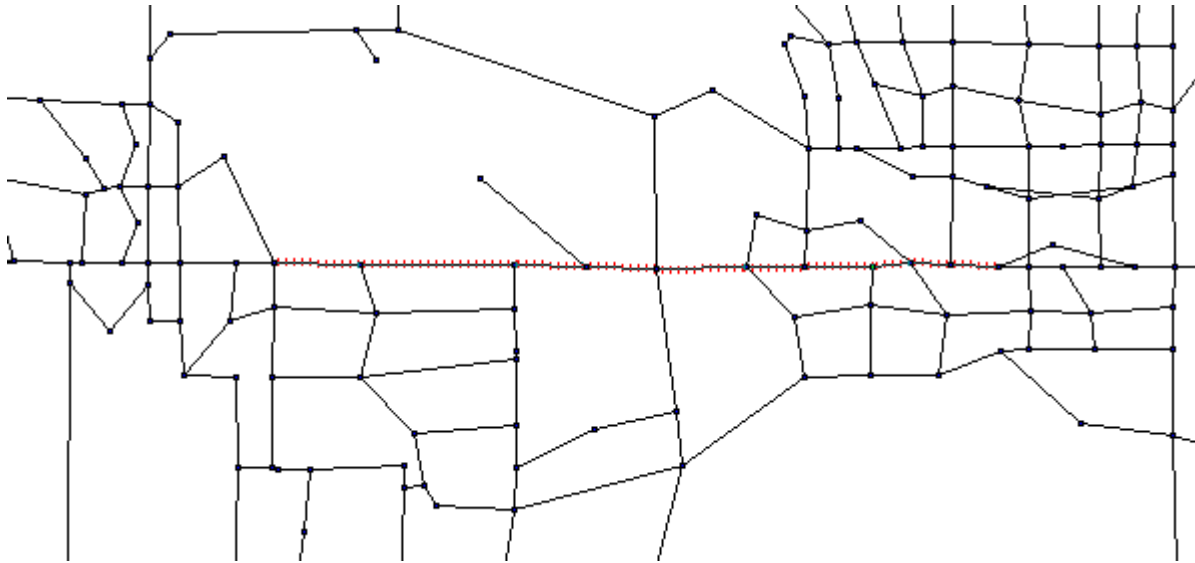
For the first case - using the information tool to display the attributes of a link. This modification is performed the same for the link attributes as for the centroid attributes. The information tool is used to select each link that needs modification, change to the arrow pointer to make the modification, then select the next link that needs to be modified, etc. Continue this process until the links in the network contain the desired information.



The screenshot shows a network map on the left and an 'Info Tool' window on the right. The map displays a network of black lines with a red line segment highlighted. The 'Info Tool' window lists various attributes for the selected link, including coordinates, lengths, speeds, capacities, and IDs.

A:	1,153
AX:	447,593
AY:	4,652,266
B:	1,154
BX:	447,589
BY:	4,652,821
A_2:	0
length:	35
O:	S
S1:	4,000
speed2:	3,962
D_2:	0
L1:	32
L2:	0
L3:	0
capacity1:	23,000
capacity2:	6,226
OP:	S
S3:	4,000
speed4:	3,962
D2:	0
L4:	0
L5:	0
L6:	0
capacity3:	23,000
capacity4:	6,210
U:	
ID:	1153 1154
total_loaded_volume:	12,436
traffic_counts:	0

For the second case - where a number of links are to experience the same modification, the desired method is to use the arrow pointer and select all the links that are to experience the same modification. Holding the shift key down while making selections will enable the user to select more than one link at a time.



Then the user can select the WINDOW - NEW BROWSER WINDOW for the selection and MapInfo will display a window with the attributes for the selected set.

A	AX	AY	B	BX	BY	A_2	length	O	S1	speed2	D_2	L1	L2	I
■	1,140	448,132	4,652,273	1,141	448,380	4,652,275	0	15	S	3,000	3,000	0	33	0
■	1,141	448,380	4,652,275	1,145	448,521	4,652,292	0	9	S	3,000	3,000	0	33	0
■	1,145	448,521	4,652,292	1,130	448,670	4,652,280	0	9	S	3,000	3,000	0	33	0
■	1,140	448,132	4,652,273	1,152	447,925	4,652,273	0	13	S	3,000	3,000	0	63	0
■	1,152	447,925	4,652,273	1,153	447,593	4,652,266	0	21	S	3,500	3,500	0	63	0
■	1,185	446,203	4,652,287	1,186	446,517	4,652,285	0	20	S	3,000	3,000	0	63	0
■	1,186	446,517	4,652,285	1,187	447,080	4,652,280	0	35	S	3,000	3,000	0	63	0
■	1,187	447,080	4,652,280	1,188	447,341	4,652,273	0	16	S	3,500	3,556	0	63	0
■	1,188	447,341	4,652,273	1,153	447,593	4,652,266	0	16	S	3,500	3,556	0	63	0
■	1,130	448,670	4,652,280	1,314	448,844	4,652,279	0	7	S	3,500	3,500	0	33	0

This window can then be updated using the TABLE - COLUMN menu option to perform selection-wide updates. For example, if the selected links were to experience a construction scenario and the capacities were to be reduced to half the original capacity. Then the TABLE - UPDATE COLUMN option would allow for this to take place in one step.

The screenshot shows a dialog box titled "Update Column". It has the following fields and controls:

- Table to Update:** A dropdown menu with "Query20" selected.
- Column to Update:** A dropdown menu with "capacity1" selected.
- Get Value From Table:** A dropdown menu with "Query20" selected, and a "Join..." button to its right.
- Value:** A text input field containing "capaicty1 / 2", and an "Assist..." button to its right.
- Options:** A checked checkbox labeled "Browse Results".
- Buttons:** "OK", "Cancel", and "Help" buttons at the bottom.

It is important to be careful when performing network modifications in this manner that the update is only performed in the selected set or QUERY and not on the original links tables as a whole. The update on the selected set will update the appropriate rows in the links table. Also, if the scenario is intended to affect both lanes of traffic, the modification needs to be performed on both the A to B direction and the B to A direction.

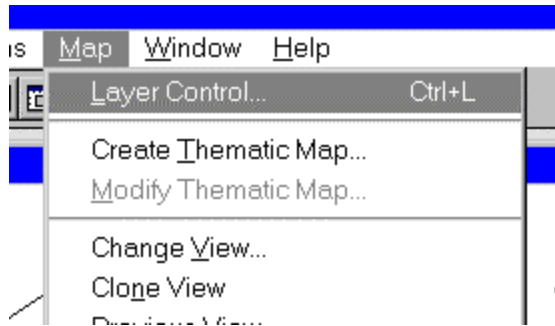
As with the modification in land use, it is good practice to save a copy of the modified network to not diminish the integrity of the initial network. It is also a good idea to save the modified table before performing a Tranplan run of the network.

### A.5.3 Change in network infrastructure

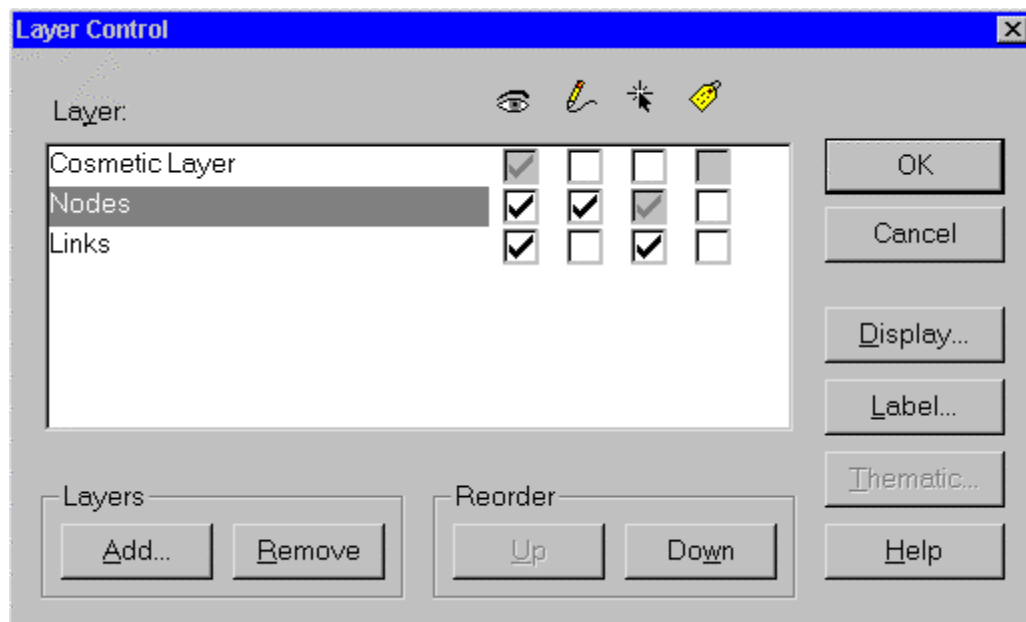
This next section provides examples and procedures for modifying the network infrastructure. These modifications can include the addition or deletion of nodes and links. The main goal of the ability to modify the network infrastructure is to allow the Tranplan model to be used to develop future or growth scenarios. The documentation will start with the procedure adding a new node, continue for adding a new link, then finish with the procedure for deleting nodes and links.

#### A.5.3.1 Adding a new node

The process for editing the characteristics of the tables within MapInfo first requires changing the desired layer to be edited to the active layer. This process is performed by selecting the MAP - LAYER CONTROL menu option.

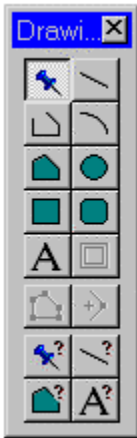


After selecting this option, the user will be presented with a window showing all the tables that are open and in the current map and the properties of the current map layers. The key to adding a node is to make the node map layer the editable layer in the map. This is done by selecting the editable box for the node layer.

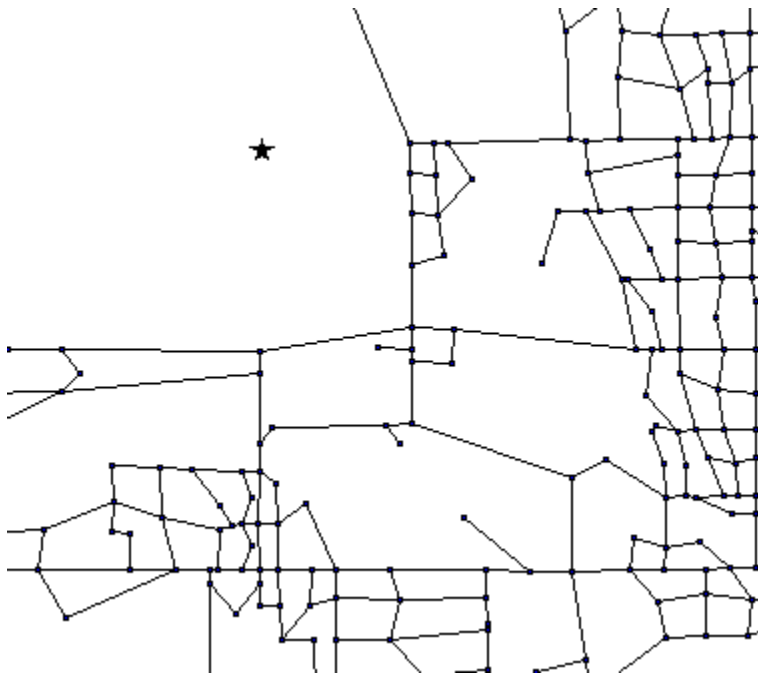


Note that the pencil or editable box is selected for the nodes.

Now that the layer is editable, the user needs to determine the appropriate location for the new nodes to be placed. The user can view the map window an open additional layers of information to provide a backdrop that will assist the placement of the new node. To place the new node in the network, the user selects the point feature from the drawing button pad.



The user can then move to the map and place a new node at the desired location. The style associated with the new node will be whatever the current point style is in MapInfo at the time it is placed.



Placing the new node in the map will automatically create a new row in the node table. This table will not have any information contained in the table and the user needs to update the table with the correct information. This update can occur in the similar fashion as the update of the node or link attributes. A method for updating the information is to select the new node with the information tool or by opening the browser table for the nodes. The advantage of opening the browser table is that the other nodes in the table will provide a model to follow.

	N	NODE	X	Y	GF	x_2	_1	_2	_3	_4	_5	GA	x
<input type="checkbox"/>	N	1,297		445,444	4,649,473	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,298		445,458	4,648,054	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,299		447,063	4,646,651	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,311		449,076	4,652,277	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,314		448,844	4,652,279	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,330		448,136	4,652,894	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,331		448,063	4,653,084	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,332		448,088	4,653,117	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,333		448,220	4,653,082	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,336		448,075	4,653,572	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,372		451,883	4,653,612	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>		0		0			0	0	0	0	0	0	

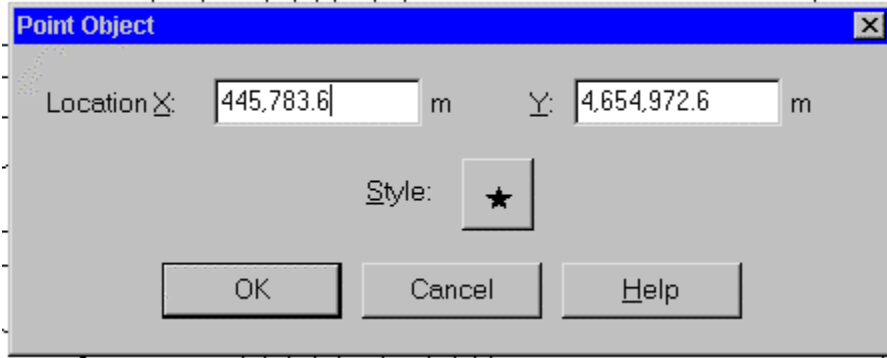
The user can then enter the attribute information the new node.

	N	NODE	X	Y	GF	x_2	_1	_2	_3	_4	_5	GA	x
<input type="checkbox"/>	N	1,297		445,444	4,649,473	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,298		445,458	4,648,054	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,299		447,063	4,646,651	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,311		449,076	4,652,277	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,314		448,844	4,652,279	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,330		448,136	4,652,894	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,331		448,063	4,653,084	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,332		448,088	4,653,117	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,333		448,220	4,653,082	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,336		448,075	4,653,572	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,372		451,883	4,653,612	GP	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,380				GP	0	0	0	0	0	0	GA

At this point, the attribute information (with the exception of the coordinate information) has been entered for node 1380. Note: had the node been a centroid, then the user would have to enter values for the productions and attractions.

Another special consideration if the new node is a centroid and the external stations are numbered consecutively following the internal zones. If this is the case with the network (there are no extra centroids available for growth), then the user must renumber all of the external stations and the associated external connectors to accurately represent the change. This may end up being a timely process. Therefore, it is recommended that the user develop dummy centroids to allow for growth in the future to be modeled without the need to renumber all of the external stations and connectors each time a new centroid is added to the network.

Returning to the placement of node attributes, looking back, we left the coordinate information for the node empty for the time being. We will now fill in this coordinate information. The easiest method for obtaining this information is to move to the map window, change to the selecting arrow and double click on the new node. Doing this will display a new window showing the coordinates for the new node. (The map needs to be in the correct projection system). The user can then record the coordinate information and insert the information into the browser table.

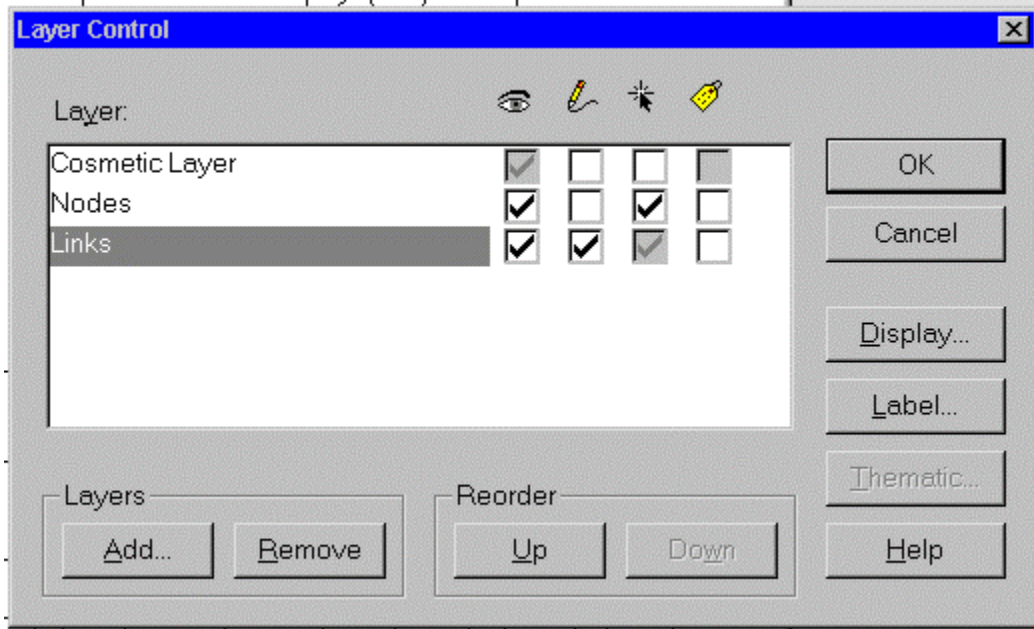


	N	NODE	X	Y	GP	x_2	_1	_2	_3	_4	_5	GA	x_2
<input type="checkbox"/>	N	1,297	445,444	4,649,473	GP	0	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,298	445,458	4,648,054	GP	0	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,299	447,063	4,646,651	GP	0	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,311	449,076	4,652,277	GP	0	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,314	448,844	4,652,279	GP	0	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,330	448,136	4,652,894	GP	0	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,331	448,063	4,653,084	GP	0	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,332	448,088	4,653,117	GP	0	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,333	448,220	4,653,082	GP	0	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,336	448,075	4,653,572	GP	0	0	0	0	0	0	0	GA
<input type="checkbox"/>	N	1,372	451,883	4,653,612	GP	0	0	0	0	0	0	0	GA
<input checked="" type="checkbox"/>	N	1,380	445,784	4,654,973	GP	0	0	0	0	0	0	0	GA

At this point, the user needs to save the table and the new node will be inserted into the network. At this point, the user can either enter a new node, run the model with the modification, or continue to modify the network through a change in the links.

### A.5.3.2 Adding a new link

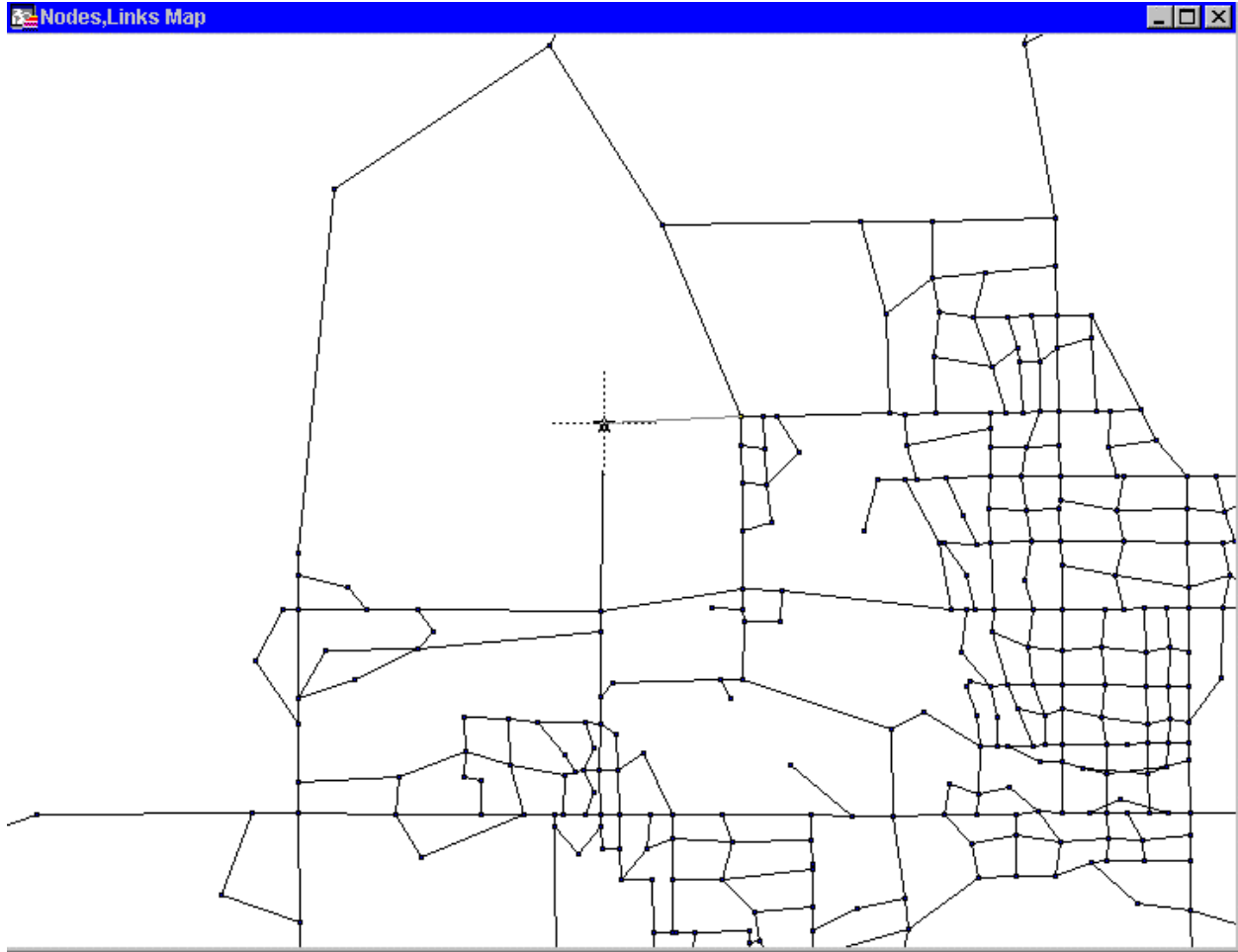
The next section of the documentation deals with the process of adding new links to the network. The need to add new links to the network could stem from the need to develop a model that represents a development trend in the network. As with the nodes, the first item is to make to links the editable layer in the network. This is done through using the MAP - LAYER CONTROL menu option.



After changing the links layer to the editable layer in the network, the user can then select the line drawing button option from the drawing button pad.



After selecting the line drawing button, the user can then move to the map and draw new links into the network to represent the placement of new streets. The process of drawing the streets can be improved through the use of the snap function, which will snap the endpoints of the line to neighboring features. Hitting the “s” key when the cursor is over the map can turn on the snap function. (If the snap feature is on the word snap will appear in the bottom of the screen  SNAP ). The user can then draw the new network links on the map.



After the drawing of the new links, MapInfo will place two new rows in the links attribute table. The rows will be empty until the user enters the appropriate attribute information.

	A	AX	AY	B	BX	BY	A_2	length	O	S1	speed2	D_2	L1
<input type="checkbox"/>	1,205	447,082	4,651,392	1,237	446,978	4,650,760	0	40	S	3,000	3,000	0	
<input type="checkbox"/>	1,117	449,481	4,652,274	1,107	449,480	4,652,130	0	9	S	3,500	3,600	0	
<input type="checkbox"/>	1,106	449,481	4,652,276	1,117	449,481	4,652,274	0	1	S	3,500	3,000	0	
<input type="checkbox"/>	71	444,152	4,651,304	1,289	444,159	4,651,106	0	12	S	1,500	1,500	0	
<input type="checkbox"/>	59	443,335	4,651,804	1,291	443,537	4,652,319	0	34	S	1,500	1,500	0	
<input type="checkbox"/>	59	443,335	4,651,804	1,287	443,837	4,651,632	0	33	S	3,000	3,000	0	
<input type="checkbox"/>	0	0	0	0	0	0	0	0		0	0	0	
<input type="checkbox"/>	0	0	0	0	0	0	0	0		0	0	0	

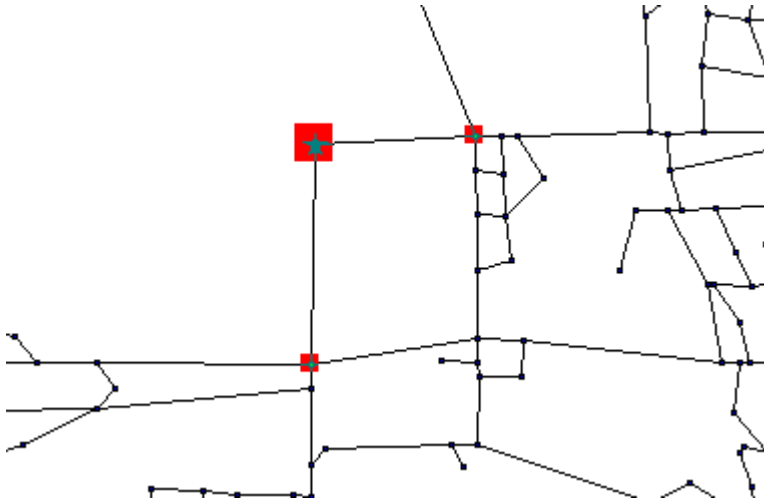
The user needs to enter the appropriate attribute information. The first step the user can do is to enter the Tranplan link information. This information is Tranplan specific information related to the operation of the link such as speed, capacity, direction code, and link group options. This information should be available and related to the scenario the user wishes to develop. To enter this information, the user can type the new information directly into the browser table or through use of the information tool. If the browser table is open, the user can select the arrow pointer and type in the new information.

Links Browser															
	length	O	S1	speed2	D_2	L1	L2	L3	capacity1	capacity2	OF	S3	speed4	D2	L4
<input type="checkbox"/>	40	S	3,000	3,000	0	12	0	0	10,900	755	S	3,000	3,000	0	0
<input type="checkbox"/>	9	S	3,500	3,600	0	33	0	0	19,000	11,136	S	3,500	3,600	0	0
<input type="checkbox"/>	1	S	3,500	3,000	0	33	0	0	19,000	8,535	S	3,500	3,000	0	0
<input type="checkbox"/>	12	S	1,500	1,500	0	0	0	0	0	1,501	S	1,500	1,500	0	0
<input type="checkbox"/>	34	S	1,500	1,500	0	0	0	0	0	85	S	1,500	1,500	0	0
<input type="checkbox"/>	33	S	3,000	3,000	0	0	0	0	0	2,337	S	3,000	3,000	0	0
<input type="checkbox"/>	0	S	4,500	4,500	0	33	0	0	19,000	0	S	4,500	0	0	0
<input type="checkbox"/>	0		0	0	0	0	0	0	0	0		0	0	0	0

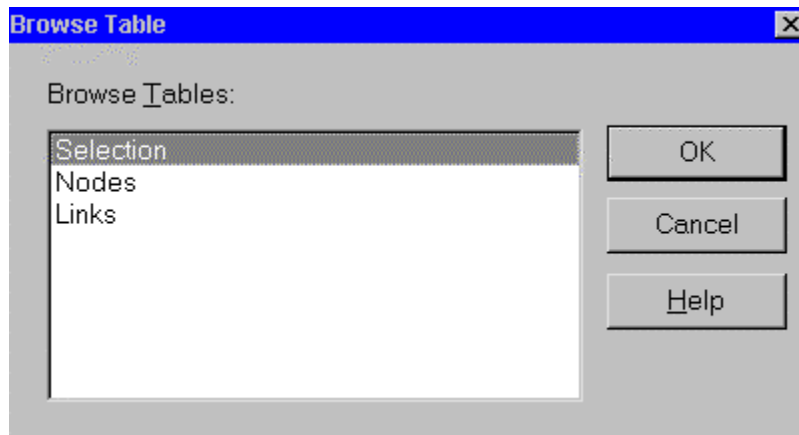
Otherwise, the user can select the links with the information tool. This will open a new window of the attribute information where the user can enter the new information.

Info Tool	
A:	0
AX:	0
AY:	0
B:	0
BX:	0
BY:	0
A_2:	0
length:	0
O:	S
S1:	4,500
speed2:	0
D_2:	0
L1:	33
L2:	0
L3:	0
capacity1:	19,000
capacity2:	0
OP:	S
S3:	4,500
speed4:	0
D2:	0
L4:	0
L5:	0
L6:	0
capacity3:	19,000
capacity4:	0
U:	
ID:	
total_loaded_volume:	0
traffic_counts:	0

The other pieces of attribute information to add include the node numbers, coordinate information, length, and ID column. The method for developing the node numbers and coordinates is a manual process that involves selecting all the nodes making up the endpoints of the new links.

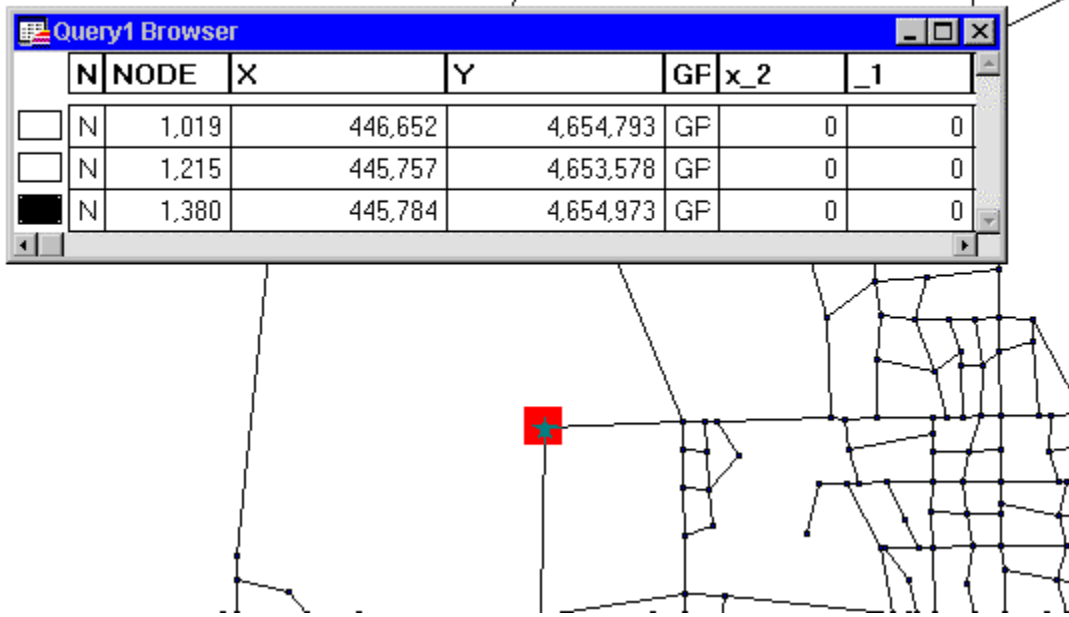


The next step is to open a new browser window for the selected nodes. This is done by using the WINDOW - NEW BROWSER WINDOW menu option and selecting the SELECTION as the table to open.



N	NODE	X	Y	GF	x_2	_1
N	1,019	446,652	4,654,793	GF	0	0
N	1,215	445,757	4,653,578	GF	0	0
N	1,380	445,784	4,654,973	GF	0	0

The new browser window that was just opened contains the node number and coordinate information that the user needs to insert into the link attribute table. The insertion can be done by either manually typing the information into the links browser table or through using the copy - paste options. The user can identify the node for which the attribute information is displayed for by selecting the box in the browser window.



The same process can be done for the links. Once the user knows which piece of attribute information is associated with graphics, the user can then insert the appropriate information from the selected node attribute table into the link attribute table.

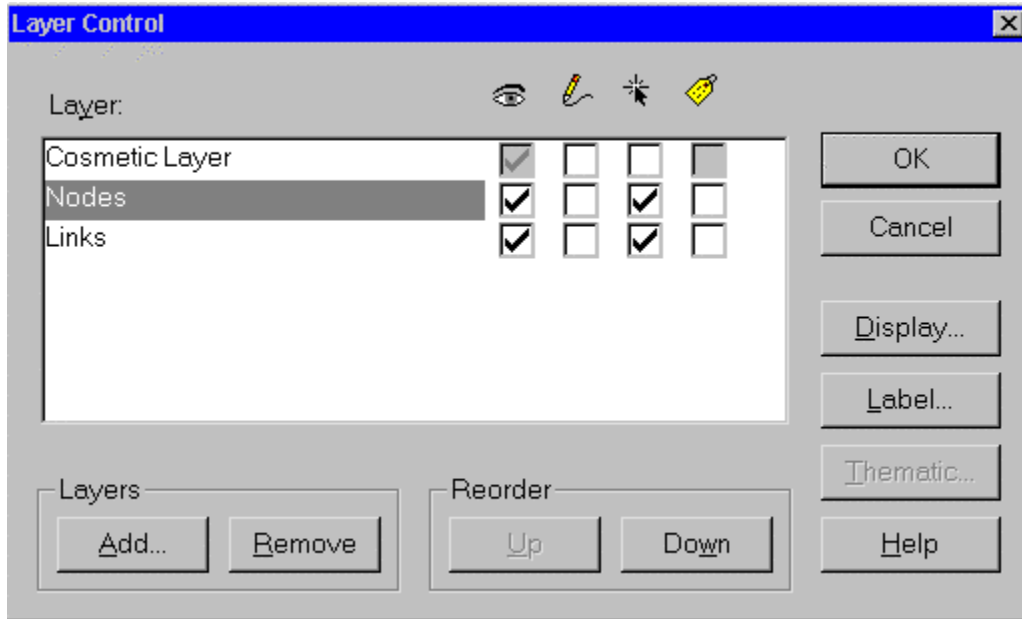
The figure shows a window titled "Links Browser" containing a table with the following data:

	A	AX	AY	B	BX	BY	A_2	length	O	S1	speed2
<input type="checkbox"/>	1,205	447,082	4,651,392	1,237	446,978	4,650,760	0	40	S	3,000	3,00
<input type="checkbox"/>	1,117	449,481	4,652,274	1,107	449,480	4,652,130	0	9	S	3,500	3,60
<input type="checkbox"/>	1,106	449,481	4,652,276	1,117	449,481	4,652,274	0	1	S	3,500	3,00
<input type="checkbox"/>	71	444,152	4,651,304	1,289	444,159	4,651,106	0	12	S	1,500	1,50
<input type="checkbox"/>	59	443,335	4,651,804	1,291	443,537	4,652,319	0	34	S	1,500	1,50
<input type="checkbox"/>	59	443,335	4,651,804	1,287	443,837	4,651,632	0	33	S	3,000	3,00
<input checked="" type="checkbox"/>	1,215	445,757	445,757	1,380	445,784	4,654,793	0	0	S	4,500	4,50
<input type="checkbox"/>	1,019	446,652	4,654,793	1,380	445,784	4,654,793	0	0	S	4,500	

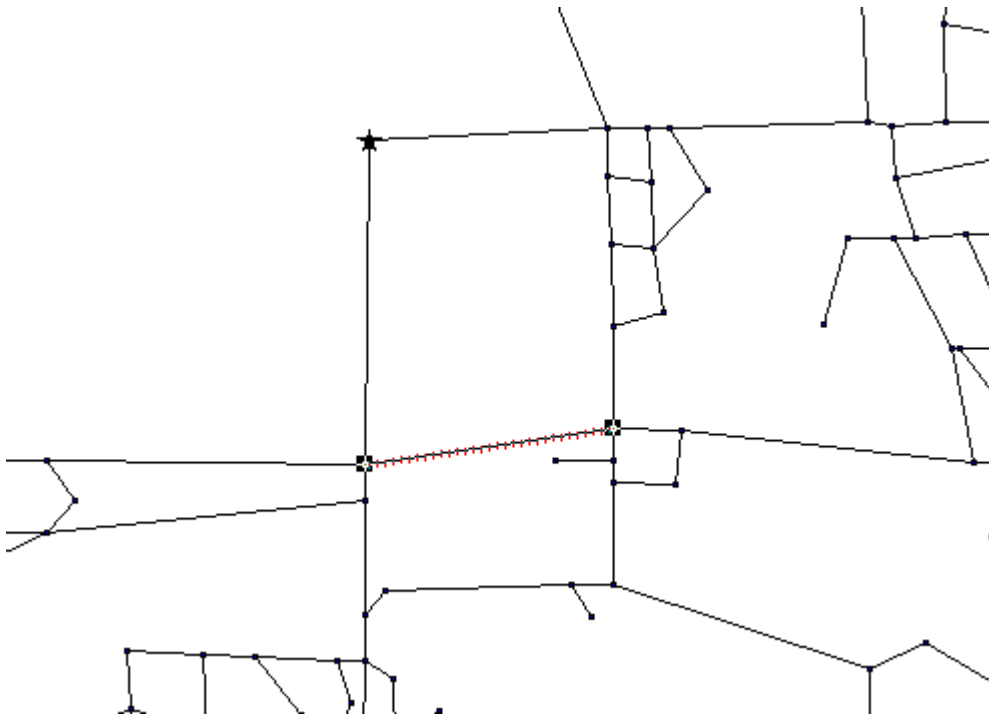
Notice that the last two rows of the links table have been filled with the required Tranplan information. At this point, the user can save the links file as a new scenario and perform a model run to determine the effect the change had on the entire system.

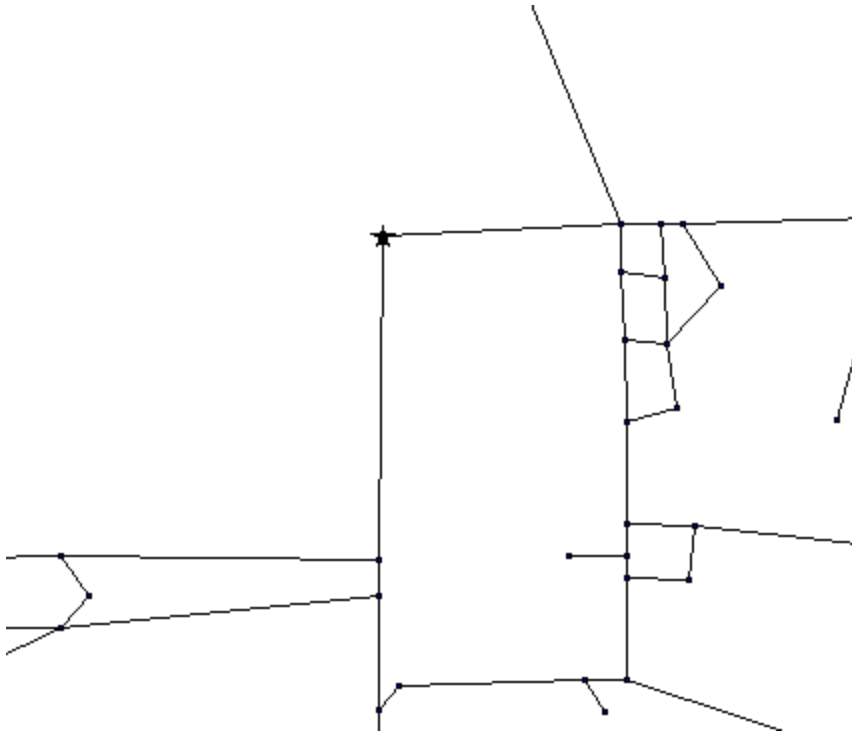
### A.5.3.3 Deleting a node or a link

The next section documents the process for deleting a node or a link. This is a requirement sometimes when developing a modified network. The first item required for deleting the information is to make the appropriate map layer the editable layer through use of the MAP - LAYER OPTION menu option.



After make the appropriate layer of the map editable, the user then needs to use the arrow pointer tool to select the appropriate feature to be deleted. In the example, the user selects the appropriate feature and presses the delete key on the keyboard.





Notice that the link feature that was selected is not removed from the model. The selection and detection process will allow the user to remove any of the unnecessary nodes and links from the network.

After removing any feature from the network, it is important to perform a TABLE - MAINTENANCE - PACK TABLE option to remove the empty records from the table. This is to say that when a feature is deleted, the row that the attribute information was stored in is not empty and needs to be removed before running the model through Tranplan. An example is shown.

	A	AX	AY	B	BX	BY	A_2
<input type="checkbox"/>	1,213	447,688	4,651,555	1,151	448,137	4,651,873	0
<input type="checkbox"/>	1,150	448,377	4,651,883	1,214	448,379	4,652,138	0
<input type="checkbox"/>	1,214	448,379	4,652,138	1,141	448,380	4,652,275	0
<input type="checkbox"/>							
<input type="checkbox"/>	1,215	445,757	4,653,578	1,216	445,756	4,653,446	0
<input type="checkbox"/>	1,216	445,756	4,653,446	1,162	445,753	4,653,035	0
<input type="checkbox"/>	1,213	447,688	4,651,555	1,217	447,551	4,651,022	0
<input type="checkbox"/>	1,217	447,551	4,651,022	1,218	448,300	4,650,658	0
<input type="checkbox"/>	1,217	447,551	4,651,022	1,219	447,098	4,650,712	0
<input type="checkbox"/>	1,219	447,098	4,650,712	1,220	447,074	4,650,393	0

After running the PACK TABLE command, the table doesn't have the empty row.

Links Browser							
	A	AX	AY	B	BX	BY	A_2
<input type="checkbox"/>	1,213	447,688	4,651,555	1,151	448,137	4,651,873	0
<input type="checkbox"/>	1,150	448,377	4,651,883	1,214	448,379	4,652,138	0
<input type="checkbox"/>	1,214	448,379	4,652,138	1,141	448,380	4,652,275	0
<input type="checkbox"/>	1,215	445,757	4,653,578	1,216	445,756	4,653,446	0
<input type="checkbox"/>	1,216	445,756	4,653,446	1,162	445,753	4,653,035	0
<input type="checkbox"/>	1,213	447,688	4,651,555	1,217	447,551	4,651,022	0
<input type="checkbox"/>	1,217	447,551	4,651,022	1,218	448,300	4,650,658	0
<input type="checkbox"/>	1,217	447,551	4,651,022	1,219	447,098	4,650,712	0
<input type="checkbox"/>	1,219	447,098	4,650,712	1,220	447,074	4,650,393	0

It is important to perform the PACK TABLE command for both the nodes and links if there was a change to both tables. After performing the PACK TABLE command, the nodes and/or links will be successfully removed from the network.

This section documented the process of performing network modifications of the Tranplan network within the MapInfo environment.