

Travel Demand Model and GIS Technical Transfer Support for Alabama Cities

By

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16. Abstract Travel demand models are computerized programs intended to forecast future roadway traffic volumes for a community based on selected socioeconomic variables and travel behavior algorithms. Software to operate these travel demand models is currently available to all 12 of the state's Metropolitan Planning Organizations, provided by the Alabama Department of Transportation. Unfortunately, many planners and engineers responsible for maintaining and operating these models have received little formal education regarding the model development, basics of transportation planning within the Four-Step Urban Transportation Planning Process, calibrating and validating the model, and using the model for traffic forecasts. The two main objectives of this work were to provide training to interested Alabama cities on travel demand models and GIS and to enhance the interface and documentation to facilitate easier use of the integrated environment.		
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Executive Summary

Travel demand models are computerized programs intended to forecast future roadway traffic volumes for a community based on selected socioeconomic variables and travel behavior algorithms. Software to operate these travel demand models is currently available to all 12 of the State's Metropolitan Planning Organizations, provided by the Alabama Department of Transportation. Unfortunately, many planners and engineers responsible for maintaining and operating these models have received little formal education regarding the model development, basics of transportation planning within the Four-Step Urban Transportation Planning Process (UTPP), calibrating and validating the model, and using the model for traffic forecasts.

There were two main objectives of this work. The first objective was to provide training through scheduled workshops at interested Alabama cities on travel demand models and geographic information systems (GIS). These workshops focused on the basics of the UTPP Four-Step process, operation of the specific travel demand model, integration of the model with GIS, and use of the combined system for future travel forecasting. The second objective was to enhance the software interface and documentation to facilitate easier use of the integrated environment.

This report provides the results of the project. First a summary is provided of the workshops and education program is. This summary contains workshop agendas, participant lists, comments, and individual training requested by MPO within Alabama. Second, a summary is presented of the improvements made to the existing travel demand model/GIS interface.

This project was performed during an 18-month period. It supplied transportation planners and engineers within Alabama with technical training and improved software to integrate TRANPLAN models with ArcView GIS. This project provided needed help to transportation professionals in Alabama and it was well received.

Chapter 1

Introduction

Travel demand models are computerized programs intended to forecast future roadway traffic volumes for a community based on selected socioeconomic variables and travel behavior algorithms. Software to operate these travel demand models is currently available to all 12 of the State's Metropolitan Planning Organizations (MPOs), provided by the Alabama Department of Transportation (ALDOT). Unfortunately, many planners and engineers responsible for maintaining and operating these models have received little formal education regarding the model development, basics of transportation planning within the Four-Step Urban Transportation Planning Process (UTPP), calibrating and validating the model, and using the model for traffic forecasts.

There were two main objectives of this work. The first objective was to provide training through scheduled workshops at interested Alabama cities on travel demand models and geographic information systems (GIS). These workshops focused on the basics of the UTPP Four-Step process, operation of the specific travel demand model, integration of the model with GIS, and use of the combined system for future travel forecasting. The second objective was to enhance the interface and documentation to facilitate easier use of the integrated environment.

The technical approach to the problem was performed through two simultaneous efforts each lasting from January 1, 2000 through June 30, 2001. The first effort (Track A) addressed travel demand education through scheduled workshops and the second effort (Track B) focused on the improvements of the models and documentation. Track A was segmented into three main tasks.

Task 1. Identify Needs for Alabama Cities

Interested Alabama cities were contacted and asked what aspects of travel demand modeling would be most interesting to their particular agency. This task was accomplished through phone surveys and/or direct meeting with representatives from each metropolitan planning area within the state. For smaller communities, these areas were either contacted directly or through ALDOT.

Task 2. Prepare Educational Material

After ascertaining the existing knowledge level for each community, appropriate educational material was developed for hands-on workshops for presentation at each individual community. This education material ranged from introduction to GIS and travel modeling to advanced model calibration and simulation of model results.

Task 3. Provide the Workshops at Convenient Times and Locations

The educational material developed in Task 2 were disseminated to planners and engineers at local sites (or group sites) allowing end-users to fully participate in the workshop. These workshops were scheduled to allow the maximum participation for

each training session while minimizing the impact on teaching and other activities of Dr. Anderson.

Track B was also be segmented into three main tasks.

Task 1. Improve Existing Interface and Documentation

Using feedback from existing users, the interface programs and documentation were improved to provide easier use and better understanding. In addition, suggested capabilities that were not previously included in the programs were addressed.

Task 2. Beta Testing of the Improve Interface

After improvements, selected communities were allowed to Beta Test the updated programs and to review the documentation to allow for required changes. All communities were open to be Beta Test sites, and the programs and documentation were distributed through an Internet site established for this project.

Task 3. Develop Final Interface and Documentation

Based on the results of the Beta Test sites, a final version of the interface and documentation were developed and distributed to planners and engineers throughout Alabama, and possibly nationwide, using the Internet.

This report provides the results of the two tracks of research identified in this introduction. The initial portion of this report gives a summary of the workshops and education program. It contains workshop agendas, participant lists, comments, and individual training requested by MPOs within Alabama. The next portion of this report gives a summary of the improvements made to the existing travel demand model/GIS interface. The report concludes with comments from MPO representatives that benefited from this project.

Chapter 2

Workshops and Individual Training

The first objective in this project was to develop educational material and conduct workshops and training sessions on travel demand modeling and GIS. For this project, three workshops were conducted on different topics related to travel modeling and GIS. In addition, individual training sessions were held at different MPOs around the state. This chapter will summarize the training interests for the MPOs and highlight the three workshops. The chapter concludes by summarizing the four training sessions.

The first task related to the workshops and individual training was a query to transportation planners of Alabama to determine their educational interests. An inquiry was sent to all MPO and the Alabama Department of Transportation. The following version has been modified slightly from the version originally sent regarding a certificate program in transportation planning:

Please identify the following courses that you would consider important for workshop consideration:

Introduction to TRANPLAN/VIPER
Introduction to GIS
Traffic modeling
Model/GIS integration
Transportation economics
Intelligent transportation systems

Introduction to urban planning
Traffic flow theory
Model calibration and validation
Traffic simulation
Pavement management
Traffic assignment methodology

Of the 12 choices, the greatest number of responses focused on model calibration and validation, Model/GIS integration, and Introduction to TRANPLAN/VIPER. It was determined from this information that the workshops should be focused around these central themes. As will be shown later in this report, these topics were the focus of the first two workshops. The theme of the remaining workshop was modified as the project progressed.

There were three workshops conducted during the course of this project. The first two workshops were hosted by the Gadsden MPO and held at the Bevill Center at Gadsden State Community College. The topics for these first two workshops included basic TRANPLAN modeling, TRANPLAN Model/GIS (ArcView) integration, model calibration and validation, scenario management, and the use of VIPER for analysis. The final workshop was held in Huntsville, in the Engineering Building on the campus of the University of Alabama in Huntsville. The topic for this workshop was advanced TRANPLAN functionality. Table 2-1 contains the agendas for the individual workshops.

Table 2-1. Agenda for the three workshops

*Workshop 1. TRANPLAN-ArcView Two Day Training Session.
June 14-15, 2000. Held in Gadsden, AL.*

Day 1. Introductions

Trip distribution

Introduction to the gravity model

Parameters commonly used in TRANPLAN

Matrix manipulations (going from P/A to O/D)

Traffic assignment

All-or-nothing

Equilibrium

Incremental

Stochastic

Getting the results

Day 2. Introduction to TRANPLAN/ArcView interface

File and folder set-up

View a network

Format Netcard output

Create a TRANPLAN network

Create a new network

Running TRANPLAN from ArcView

Brief introduction to analysis capabilities

*Workshop 2. Validation of Travel Models.
February 15-16, 2001. Held in Gadsden, AL.*

Day 1. Welcome

Trip generation and travel rate indices project meeting

Model validation parameters and justification

Day 2. Computer work on model validation

Computer work with scenario management

Computer work with VIPER

*Workshop 3. Advanced TRANPLAN Training.
June 28-29, 2001. Held in Huntsville, AL*

Day 1. Welcome

Trip generation and travel rate indices project update

Advanced TRANPLAN and VIPER model capabilities

Select link analysis

Build selected link trip table

Day 2. Computer work on advanced model capabilities

Modeling of high occupancy vehicle lanes

Turning movement analysis

Sub-area modeling

Volume/capacity ratios

Open lab time to ask model specific questions

Attendees for the workshops were from 11 MPOs in Alabama, the Alabama Department of Transportation, and various consulting companies from Alabama and Georgia. Figure 2-1 shows the locations of attendees to the workshops (from within Alabama) and Appendix A contains handouts/overheads used for the workshops.

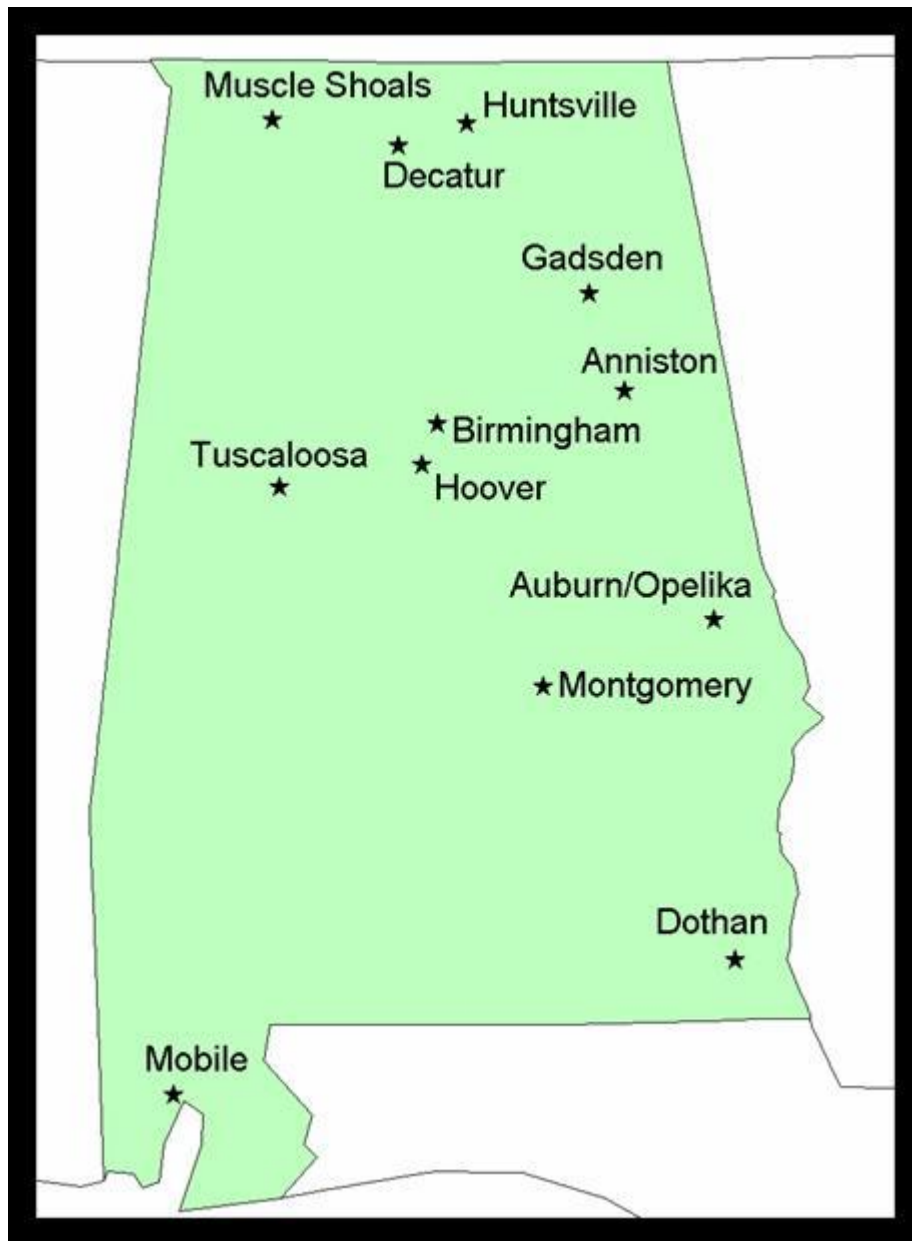


Figure 2-1. Location of workshop attendees from within Alabama

The individual training sessions allowed transportation planners to ask questions and get answers regarding their specific model set-up and operation, with topics ranging from location of files used to assign traffic to advanced scenario management systems using GIS. The training sessions were held at the offices of the following organizations:

- *Anniston Metropolitan Planning Organization*

- *Northwest Alabama Council of Local Governments*
- *Regional Planning Commission for Greater Birmingham*
- *Huntsville Metropolitan Planning Organization*
- *Auburn/Opelika Metropolitan Planning Organization*

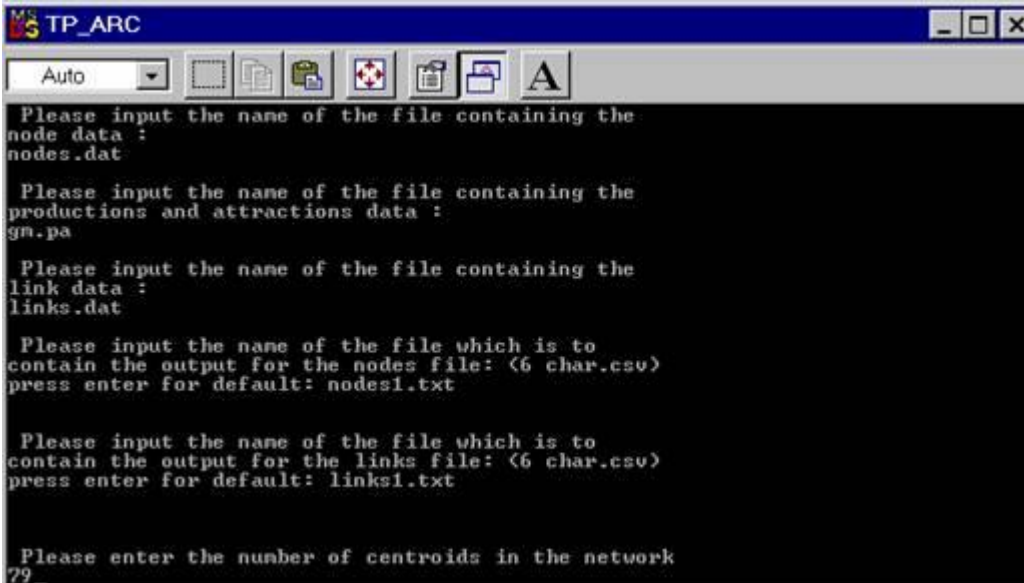
The educational components of this project were performed to provide transportation planners and engineers in Alabama increased knowledge of TRANPLAN, VIPER, ArcView GIS, and general transportation modeling.

Chapter 3

Improvements to the Modeling Software

This project also required improvements to the TRANPLAN/ArcView modeling environment. The improvements came from the conversion of the programs from FORTRAN to Visual Basic, allowing more flexibility and facilitating a user-friendly system. In addition, the majority of the improvements were made to the analysis portion of the software with new features added to assist in model evaluation. This chapter highlights some of the improvements made to the modeling environment. For complete documentation of the modeling environment, refer to Appendix B. The author is indebted to Dr. Reginald Souleyrette of Iowa State University, who performed a similar project for the Iowa Department of Transportation, and who provided input and content for this chapter.

The first area of improvements made to the modeling environment focused on the migration of code from FORTRAN to Visual Basic. This change was necessary to allow the programs to become more user friendly and reflect a windows-based environment most people are comfortable with today. An example program is shown in FORTRAN (Figure 3-1) and the modified program in Visual Basic is shown in Figure 3-2. Similar changes have been made to all programs necessary for running the environment.



```
MS TP_ARC
Auto
Please input the name of the file containing the
node data :
nodes.dat

Please input the name of the file containing the
productions and attractions data :
gn.pa

Please input the name of the file containing the
link data :
links.dat

Please input the name of the file which is to
contain the output for the nodes file: <6 char.csv>
press enter for default: nodes1.txt

Please input the name of the file which is to
contain the output for the links file: <6 char.csv>
press enter for default: links1.txt

Please enter the number of centroids in the network
79
```

Figure 3-1. Original FORTRAN Program

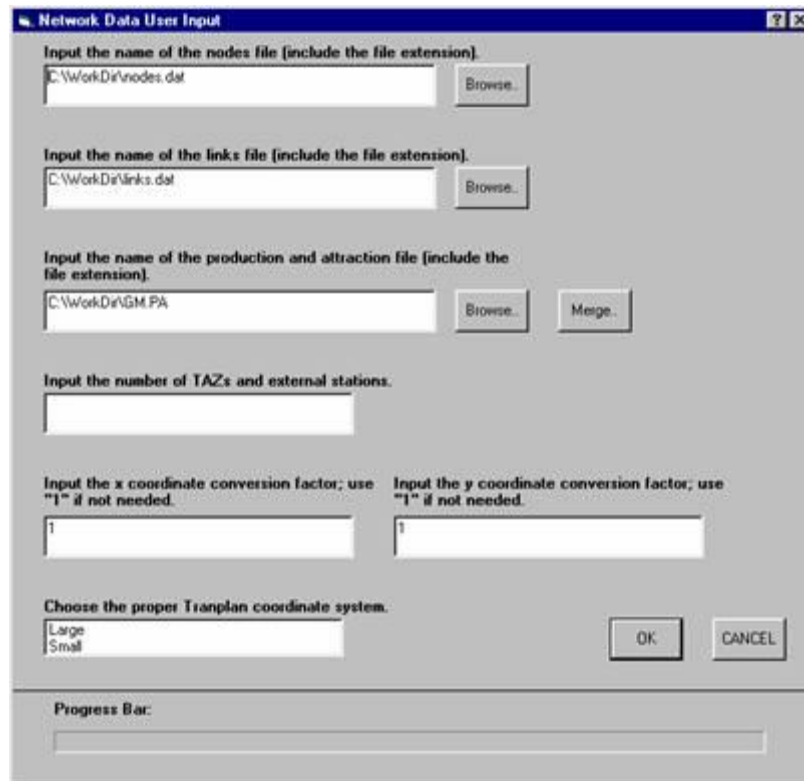


Figure 3-2. Modified Program in Visual Basic

The second major area of improvement was coding the software with the ability to create a transportation planning network, with GIS, using various data files as background. This was an enhancement over the original version where all networks brought into the environment were required to be pre-developed. This also provides a unique feature in which most Alabama transportation planning agencies showed considerable interest, the ability to quickly re-code the network in GIS allowing the network to be spatially located.

A third major improvement to the system was during the running of a TRANPLAN model. To produce assigned traffic volume, the user was provided an option to use a default TRANPLAN control file. This default file essentially made running TRANPLAN, at least at its simplest levels, possible for any MPO in the state regardless of the degree of TRANPLAN knowledge. However, it is important to point out that advanced users could still use their personal files developed for their specific networks.

The final, and most important, improvements to the modeling environment were contained in the Analysis Tools coded into ArcView GIS. These tools, shown in Figure 3-3, provide many features for analyzing transportation networks and are addressed in the following sections.

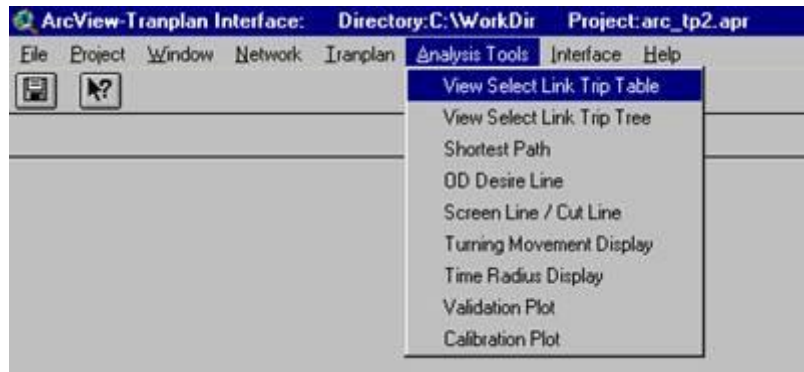


Figure 3-3. Analysis Tools in ArcView

The Select Link analysis tools allow the user to display the output from a TRANPLAN select link analysis. The interface is able to display the information in several different ways. The user selects whether the origins or destinations of the trips traveling on the selected link are to be displayed. Once both the origins and destinations are displayed, the ratio between the origins and destinations at each centroid can also be displayed. An example is shown in Figure 3-4.

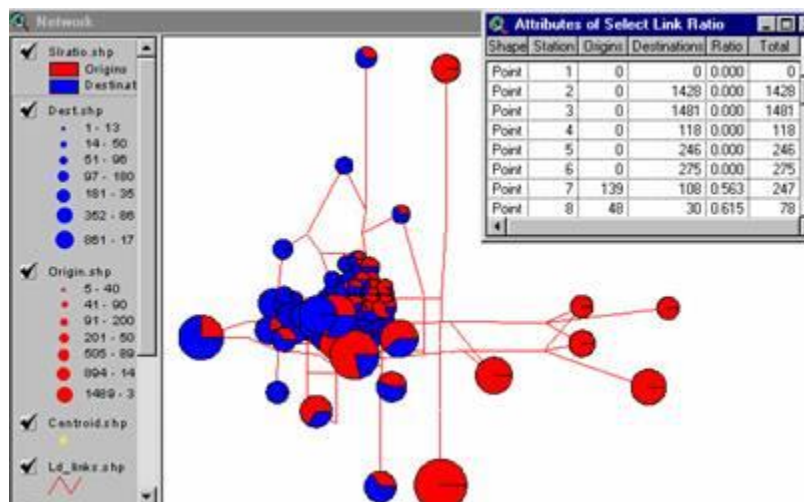


Figure 3-4. Network View with a Select Link Analysis example

The select link analysis tool, “View Select Link Trip Tree”, uses TRANPLAN select link analysis output to produce a visual display of the links loaded with trips traveling on the selected link. The final product from the “View Select Link Tree” is an ArcView shapefile. This file buffers the links in the network according to the number of trips that travel on both the buffered link and selected link. An example can be seen in Figure 3-5.

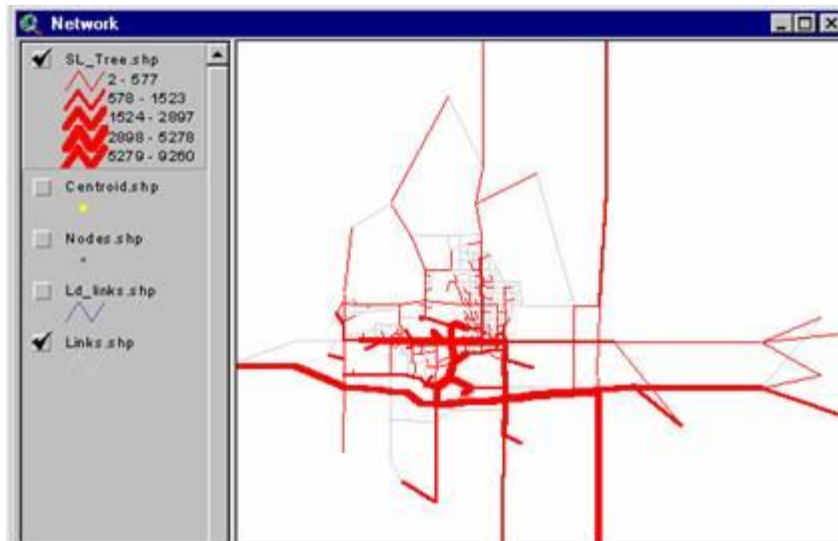


Figure 3-5. View Select Link Trip Tree Example

The Shortest Path analysis tool allows the user to identify the shortest path between any two nodes in the scenario's network. By selecting the two nodes, a shapefile showing all links that make up the shortest path between the nodes will be displayed. The shapefile that is created by the Shortest Path Analysis Tool is the important output file. An example is shown in Figure 3-6.

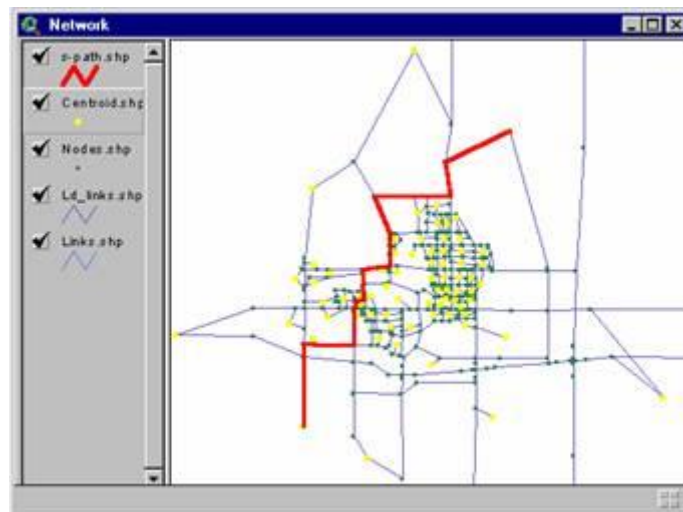


Figure 3-6. Shortest Path Example

The Desire Line program allows the user to designate an origin and destination zone from which a shapefile will be constructed. This file will create a weighted line, with the weight of the line varying proportionately with the volume between the origin and destination. By selecting the "O/D Desire Line" option from the Analysis Tools pull-down menu, the interface will prompt the user to select the two centroids for the desire line. Figure 3-7 shows how the ArcView appears while the user is selecting centroids.

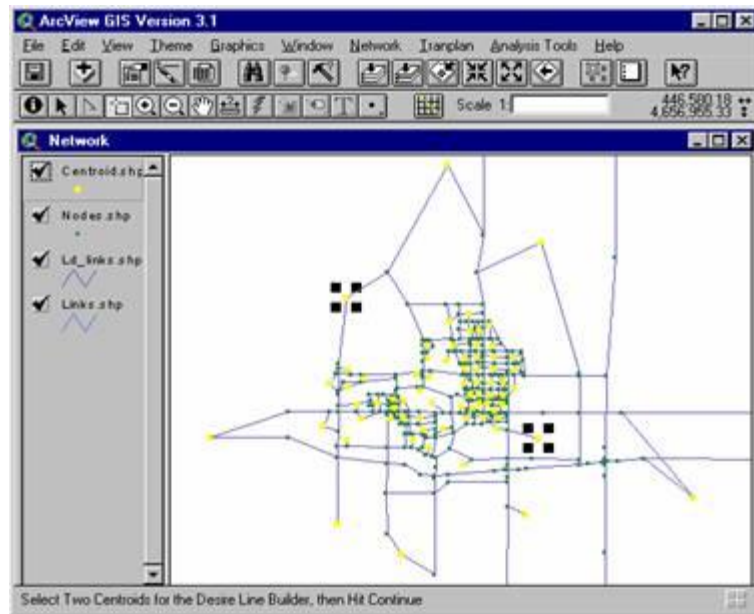


Figure 3-7. ArcView Prompting Two Centroids for Desire Line

Once the user has selected the two centroids for the desire line, the continue button will initiate the remainder of the desire line program. Only one file is produced from the Desire Line program, however, this file may contain several sets of records, depending upon the number of times of execution before ending the program. Individual desire lines are displayed according to the loaded volume that the model has assigned to travel between the origin and destination. Therefore, each line is colored according to a predetermined scale. An example of desire lines, including a breakdown of the ranges of loaded volumes can be found in Figure 3-8.

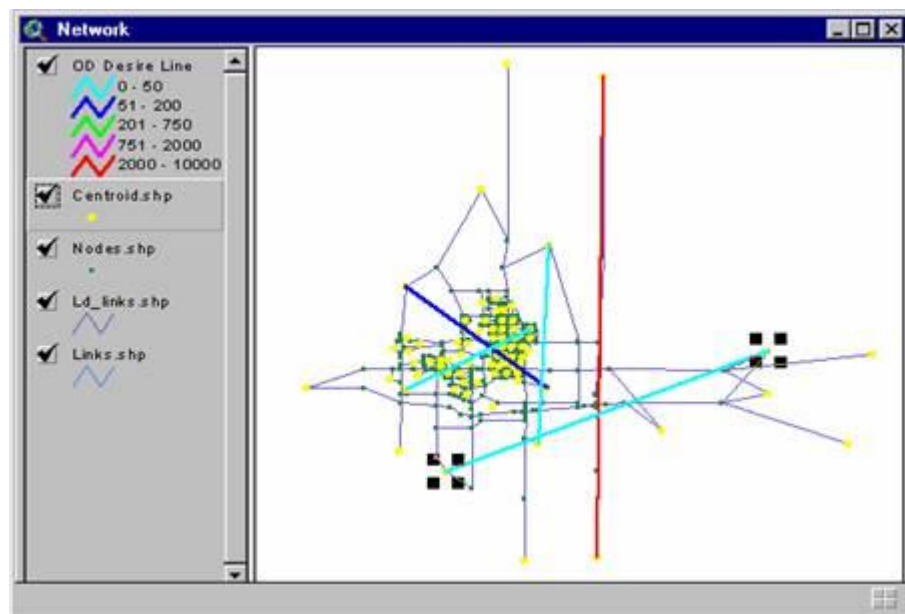


Figure 3-8. View Showing OD Desire Line Shapefile Example

The Screen/Cut Line Analysis Tool allows the user to create one or more line segments that cross one or more links in the scenario's network. These line segments, called cut lines, are drawn to intersect with links that the user would like to compare as part of the validation process. The output from the interface, called the screen lines, will give data related to the links that the cut line crosses. Each cut line constructed by the user will result in a separate screen line data table and shapefile. A shapefile is created by the interface for each set of screen lines that are produced by a particular cut line. These shapefiles contain the links that make up the screen lines, along with capacity and loaded volume data. Also, a ratio of loaded volume versus grounded counts is displayed for each screen line. Figure 3-9 shows the screen line shapefiles, along with the output tables for two of the screen lines.

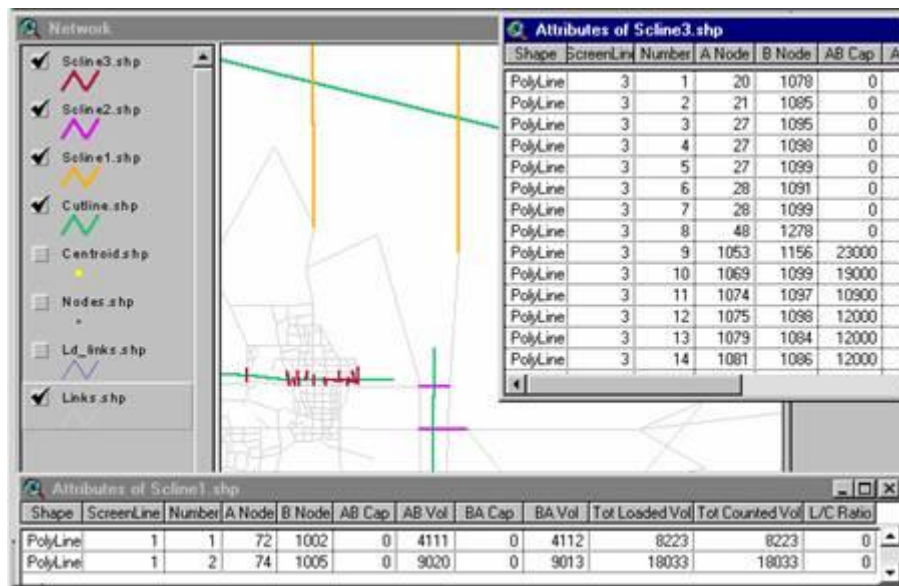


Figure 3-9. Screen Line Shapefiles and Tables

The Turning Movement Display option allows the user to select up to 10 intersections to display the modeled turning movement volumes. The interface creates a shapefile for each selected intersection, with an arrow indicating each turning movement, along with an attribute table containing the turning volumes. Shapefiles containing turning movement arrows, along with attribute tables containing the thru node, from node, to node and volume are created for the selected nodes. The shapefiles and attribute tables are named according to the order of selection, starting from zero. Figure 3-10 shows an example of the "Network" view.

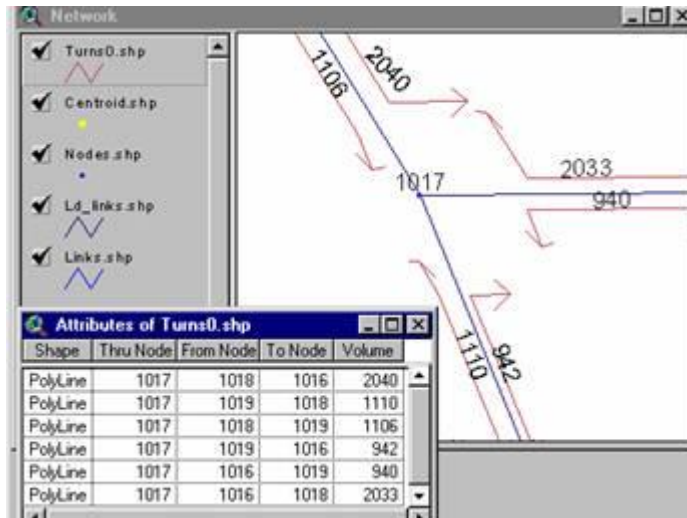


Figure 3-10. Turning Movement Display Output

By selecting a node in the network, along with a travel time, a shapefile will be produced containing all the points in the network that can be reached in the specified amount of time. First, the interface prompts the user to select the node where the time radius is to begin (see Figure 3-11).

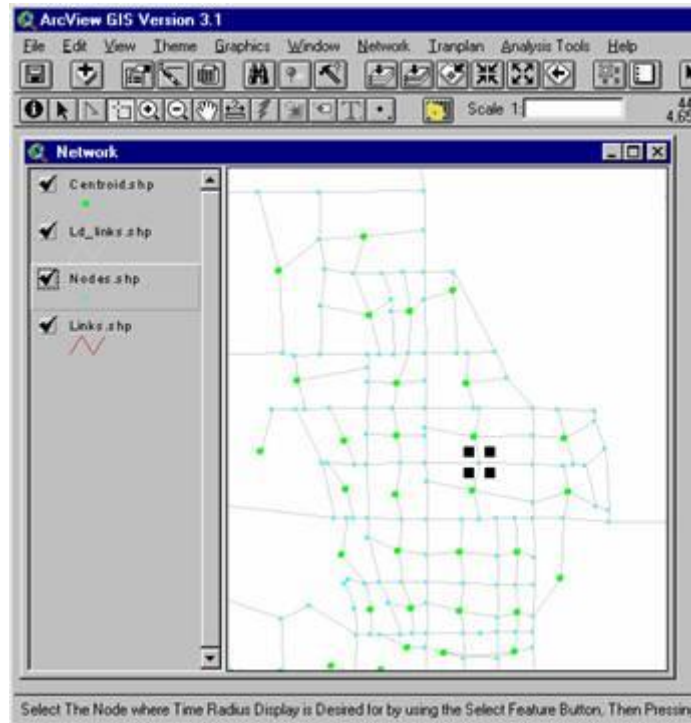


Figure 3-11. Selecting node for time radius display

The interface creates a shapefile along with an attribute table (Figure 3-12). The shapefile contains the portion of any link that can be reached from the selected node in the giving amount of time. The attribute table shows the amount of time needed to travel

to a particular link in the Timeradius shapefile. The time is calculated by dividing the link's distance by the modeled speed of the link.

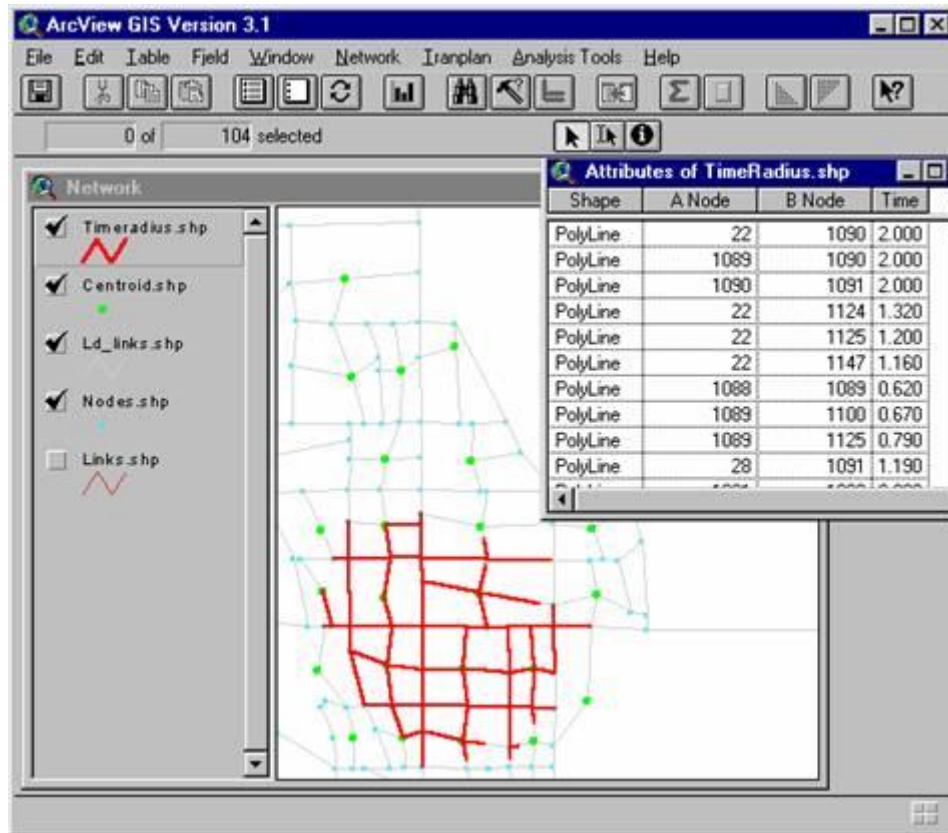


Figure 3-12. Timeradius output

The calibration plot provides a user with the ability to quickly display the predicted volumes from TRANPLAN in a visual format. The predicted volumes from TRANPLAN are used to determine the size of the buffers. The buffered links are also thematically mapped to help distinguish between different levels of volume. After the Auto-label window, the buffered shape file will automatically be displayed in the view "Network". The calibration plot shape file is shown in Figure 3-13.

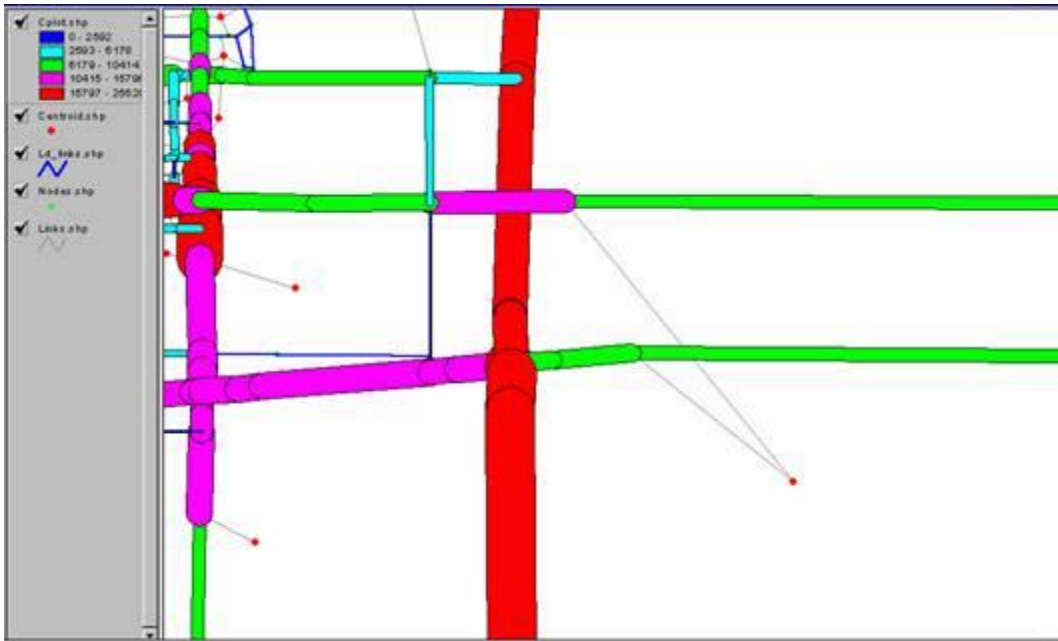


Figure 3-13. Output of Calibration Plot

The validation plot allows the user to visually plot all links in the network that have a modeled versus counted ratio higher or lower than a defined value. The percent difference between the modeled and counted volume is specified for ratios that are both too low and too high. The validation plot buffers the links according to whether the links have too much or too little loaded volume compared to counted volume. Figure 3-14 shows an example.

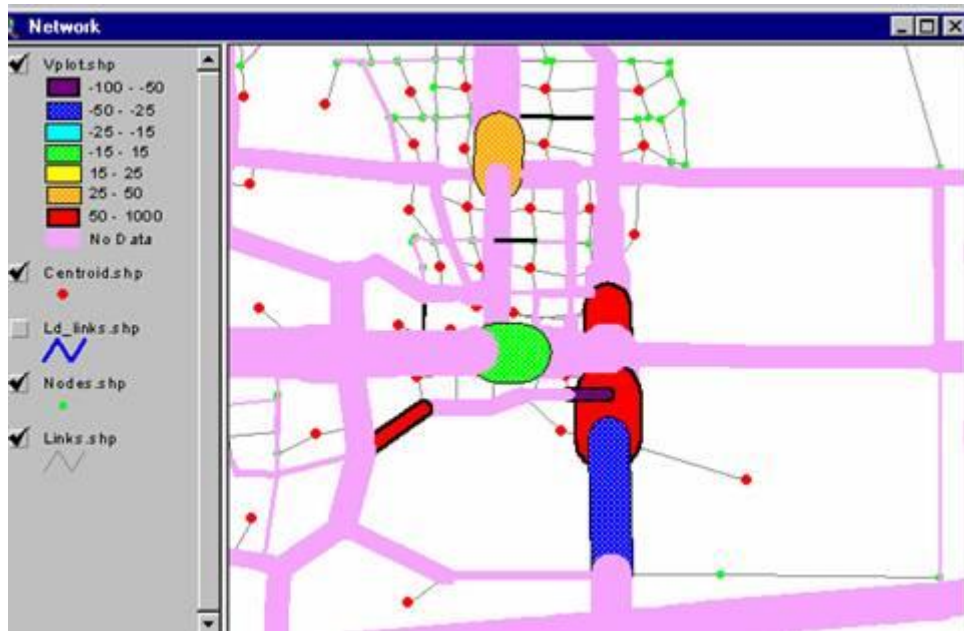


Figure 3-14. Validation Plot Example

Chapter 4

Feedback and Endorsements

This project was performed during an 18-month period in 2000-2001. It supplied transportation planners and engineers within Alabama with technical training and improved software to integrate TRANPLAN models with ArcView GIS. In response to this project, several individuals provided feedback regarding their experiences and opinion of the project. Listed below are a few responses from the individuals.

"The Workshop for TRANPLAN/ArcView software helped me a lot in the ArcView GIS applications for project ranking, project/existing traffic data analysis. This hands on workshop made it possible to overlap the TRANPLAN network over to the other GIS coverages. These kind of applications has been demanded recently."

"First of all let me thank you for all the help you gave me at the workshop in Huntsville. The Huntsville workshop has been the most beneficial to me. I feel the hands-on training is by far the most beneficial. My knowledge and understanding of the program has progressed so much from the Gadsden workshop until now. I feel that future workshops should continue to offer hands-on experience. Thank you for sharing your knowledge, patience, and time. I look forward to the next workshop."

"The training provided for TRANPLAN has been right on target. It has focused on the practical applications as well as the theoretical underpinnings of traffic modeling. The sessions on model calibration and the recent session on advanced techniques provide RPCGB staff with two points that have dramatically improved our production. I would like to see the workshops continue with an emphasis on special topics. Dr. Anderson's technique and approach to lesson material is informative and inclusive. The sessions have allowed participation by all, from the entry-level planner to the advanced traffic modeler, and the dialogue during the sessions has exposed everyone to "tricks" of the trade that are not covered in the manuals. "

From the responses of individuals who attended workshops and or who had individual training sessions, it appears that this project has been well received and that it provided needed help to transportation professionals in Alabama.


Appendix A
Slides from Workshops



Tranplan Workshop



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June 14, 2000



Outline

- Trip Distribution
 - Gravity Model
 - TRANPLAN Implementation
 - Matrix Manipulations
 - TRANPLAN Implementation
 - Traffic Assignment
 - Four Methods
 - TRANPLAN Implementation
- 

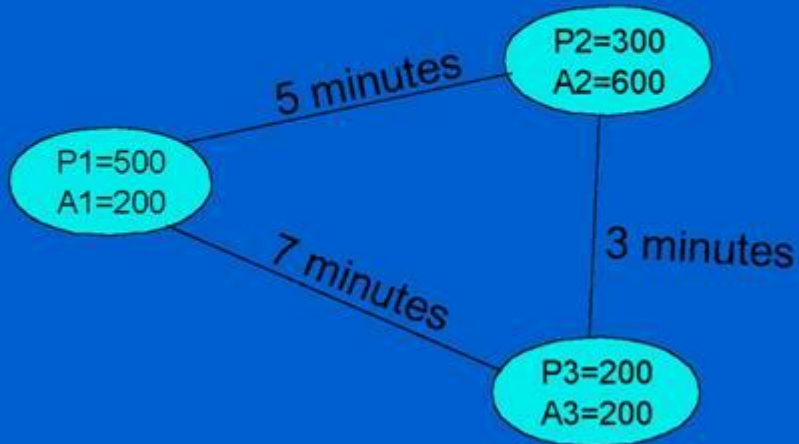
Trip Distribution

- Gravity Model
 - based on gravitational law
 - $T_{ij} = \{ [P_i * (A_j F_{ij})] / (\text{Sum} (A_j F_{ij})) \}$
 - where T_{ij} = trips from i to j
 - P_i = productions at i
 - A_j = attractions at j
 - F_{ij} = friction between i and j (usually travel time expressed as $1 / (t_{ij} * t_{ij})$)

Trip Distribution

- Requires shortest path travel time between zones
- intrazonal trips
 - travel time = $1/2 * \text{average (two closest neighbors)}$
- Must be determined iteratively
- Must have a stopping criteria

Trip Distribution



Trip Distribution

First Attempt

	Zone 1	Zone 2	Zone 3	Total Productions
Zone 1	220	240	40	500
Zone 2	13	250	37	300
Zone 3	8	130	62	200
Total Attractions	241	620	139	1000

On the first attempt, attractions are not equal to zonal attraction values

Trip Distribution

After three iterations

	Zone 1	Zone 2	Zone 3	Total Productions
Zone 1	193	245	61	499
Zone 2	11	237	52	300
Zone 3	6	114	80	200
Total Attractions	210	596	193	~ 1000

Total productions and attractions meet our preset tolerance limit.

Trip Distribution

- We now have “productions and attractions” for each zone pair
- However, each trip has two productions and zero attractions
- Need matrix utilities

Trip Distribution (TRANPLAN)

- Build Highway Network
- Highway Selected Summation
- Build Intrazonal Impedances
- Matrix Update
- Gravity Model

Trip Distribution (TRANPLAN)

```
SBUILD HIGHWAY NETWORK
SFILES
  OUTPUT FILE = HWYNET, USER ID = Snet.bin$
SOPTIONS
  LARGE COORDINATES
SPARAMETERS
  NUMBER OF ZONES = 29
  MAXIMUM NODE = 1074
SDATA
N 1 1187061 3611337
N 2 1187356 3610611
N 3 1187827 3610155
...
1 10010 20S15001500 0 0 0 0 0 0 20S15001500 0 0 0 0 0 23
1 10020 21S15001500 0 0 0 0 0 0 198S15001500 0 0 0 0 0 204
...
SEND TP FUNCTION
```

Trip Distribution (TRANPLAN)

```
SHIGHWAY SELECTED SUMMATION
$FILES
  INPUT FILE = HWYNET, USER ID = $NET.BINS
  OUTPUT FILE = HWYSKIM, USER ID = $SKIM90.SKIS
$DATA
  TABLE = TIME 1
$SEND TP FUNCTION

$BUILD INTRAZONAL IMPEDANCES
$FILES
  INPUT FILE = IZIN, USER ID = $SKIM90.SKIS
  OUTPUT FILE = IZOUT, USER ID = $SKIMG90.SKIS
$OPTION
  PRINT DETAIL
$PARAMETERS
  NUMBER OF ADJACENT ZONES = 2
$SEND TP FUNCTION
```

Trip Distribution (TRANPLAN)

```
$MATRIX UPDATE
$FILES
  INPUT FILE = UPDIN, USER ID = $SKIMG90.SKIS
  OUTPUT FILE = UPDOUT, USER ID = $SKIMG90.SK2S
$HEADERS
  INCREASE INTRAZONAL TRAVEL TIME EXTERNAL ZONES
$DATA
  TIME1, 24, 24, R 99999
  TIME1, 25, 25, R 99999
  TIME1, 26, 26, R 99999
  TIME1, 27, 27, R 99999
  TIME1, 28, 28, R 99999
  TIME1, 29, 29, R 99999
$SEND TP FUNCTION
```

Trip Distribution (TRANPLAN)

```
SGRAVITY MODEL
SFILES
  INPUT FILE = GMSKIM, USER ID -$SKIMG90.SK2S
  OUTPUT FILE = GMVOL, USER ID -$GM90.TRPS
SPARAMETERS
  MAXIMUM PURPOSE = 3
  MAXIMUM TIME = 120
  IMPEDANCE = TIME 1
  ATTRACTION CLOSURE = 5.0
SDATA
  GP 1 1 0 0 0
  GP 2 1 1325 0 0
  ...
  GA 1 1 434 0 0
  GA 2 1 3037 0 0
  ...
  GF 1 1 25214 126632 198290
  GF 2 1 21990 47295 71303
  ...
SEND TP FUNCTION
```

Matrix Manipulations

- Required to convert
 - Productions and attractions
 - Origins and destinations
- do not have balance
 - two trips going one way
 - need one out-trip and return-trip

Matrix Manipulations

Original Matrix
Productions and
Attractions

	Zone 1	Zone 2	Zone 3	Total Productions
Zone 1	193	245	61	499
Zone 2	11	237	52	300
Zone 3	6	114	80	200
Total Attractions	210	596	193	~ 1000

Step 1. Combine
trip purposes

(Same as we had one purpose)

	Zone 1	Zone 2	Zone 3	Total Productions
Zone 1	193	245	61	499
Zone 2	11	237	52	300
Zone 3	6	114	80	200
Total Attractions	210	596	193	~ 1000

Matrix Manipulations

Step 2. Transpose
Matrix

	Zone 1	Zone 2	Zone 3
Zone 1	193	11	6
Zone 2	245	237	114
Zone 3	61	52	80

Step 3. Add two
Matrices together

	Zone 1	Zone 2	Zone 3
Zone 1	386	256	67
Zone 2	256	474	166
Zone 3	67	166	160

Matrix Manipulations

Step 4. Divide by two

	Zone 1	Zone 2	Zone 3
Zone 1	193	128	34
Zone 2	128	237	83
Zone 3	34	83	80

The final matrix contains origins and destinations that should be assigned to the network.

Matrix (TRANPLAN)

```
$MATRIX MANIPULATE
```

```
$FILES
```

```
INPUT FILE = TMAN1, USER ID = $GM90.TRPS
```

```
OUTPUT FILE = TMAN3, USER ID = $GM90TOT.TRPS
```

```
$DATA
```

```
TMAN3,T1 = TMAN1,T1 + TMAN1,T2 + TMAN1,T3
```

```
$END TP FUNCTION
```

```
$MATRIX TRANSPOSE
```

```
$FILES
```

```
INPUT FILE = TRNSPIN, USER ID = $GM90TOT.TRPS
```

```
OUTPUT FILE = TRNSPOT, USER ID = $DUM.TRPS
```

```
$PARAMETERS
```

```
SELECTED TABLES = 1
```

```
$END TP FUNCTION
```

Matrix (TRANPLAN)

SMATRIX MANIPULATE

\$FILES

INPUT FILE = TMAN1, USER ID = \$GM90TOT.TRPS

INPUT FILE = TMAN2, USER ID = \$DUM.TRPS

OUTPUT FILE = TMAN3, USER ID = \$TOT90.TRPS

\$DATA

TMAN3,T1 = TMAN1,T1 + TMAN2,T1

SEND TP FUNCTION

SMATRIX UPDATE

\$FILES

INPUT FILE = UPDIN, USER ID = \$TOT90.TRPS

OUTPUT FILE = UPDOUT, USER ID = \$TOT90X.TRPS

\$DATA

T1,1- 29,1- 29, * .5

SEND TP FUNCTION

Traffic Assignment

- All-or-nothing
- Equilibrium
- Incremental
- Stochastic

Traffic Assignment

- All-or-nothing
 - Assigns all trips to the shortest path
 - No congestion affects considered
 - Good for smaller networks

Traffic Assignment

- Equilibrium
 - Attempts to minimize travel time for all travelers
 - Starts with all-or-nothing, then iterates
 - Most common

Traffic Assignment

- Incremental
 - Assigns a specified percent of the O/D trip table
 - Adjusts travel times
 - Assigns the next specified percent
 - Iterates until all trips assigned

Traffic Assignment

- Stochastic
 - Based on the probability that some people will take sub-optimal paths
 - Trips are assigned to “reasonable” paths
 - Each path receives a fraction of total trips

Traffic Assignment (TRANPLAN)

SEQUILIBRIUM HIGHWAY LOAD

\$FILES

INPUT FILE = HWYNET, USER ID = \$NET.BIN\$

INPUT FILE = HWYTRIP, USER ID = \$TOT90X.TRPS

OUTPUT FILE = LODHIST, USER ID = \$OUT.BIN\$

\$PARAMETERS

SAVE TURNS = 1000- 1372

EQUILIBRIUM ITERATIONS = 4

SEND TP FUNCTION

Calibration and Validation of Travel Models

Michael Anderson, Civil Engineering

Presented for the Alabama
Transportation Planners Association

Calibration versus Validation

- ◆ Traditional Meanings
 - Calibration of parameters
 - Validation using parameters

- ◆ Similar Meanings
 - Modify parameters to match ground counts

Steps

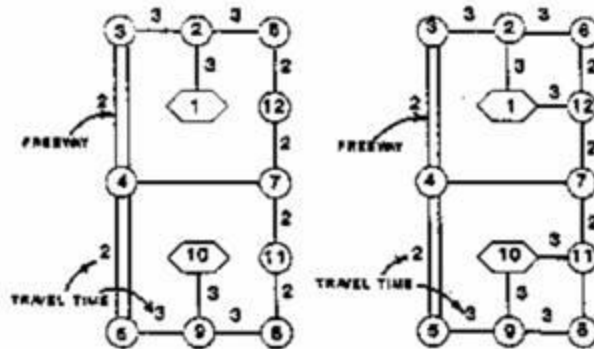
- ◆ Run model with default values
- ◆ Region-wide measures (trips/person or VMT/person)
- ◆ Screenlines and cutlines
- ◆ Determine corrective measures (system-wide or local)

Areas of adjustment

- ◆ Network characteristics
- ◆ Trip Generation rates
- ◆ Trip distribution
- ◆ Traffic Assignment

Network Characteristics

- Centriod connector locations



Network Characteristics

- Speed and Capacity

Freeways	50-60	1500-2000	Per lane
Arterials (with left turn bay)	20-45	700-1000	1 lane
	25-45	1400-2000	2 lane
	25-45	2100-3000	3 lane
Arterials (without left turn bay)	15-45	500-800	1 lane
	20-45	1200-1800	2 lane
	20-45	1900-2800	3 lane
Centriods	10-20	N/A	N/A

Network Characteristics

- ◆ Intrazonal travel times
 - Volumes too high or too low
 - Encourage trips onto or off the network

Network Characteristics

- ◆ Coding errors (Tranplan/ArcView)
 - Socioeconomic data
 - Speeds or capacities
 - Missing links
 - Roadway lengths

Trip Generation Rates

- ◆ Reasonable person trip per dwelling unit
 - 50,000-100,000 14.1 trips
 - 100,000-250,000 14.5 trips
 - 250,000-750,000 11.8 trips

Trip Generation Rates

- ◆ Based on old data
- ◆ Borrowed information
- ◆ Special generators
- ◆ Balancing factors
 - Region-wide by purpose within 10%

Trip Distribution

- ◆ Mean Trip Length
 - Friction factor data

Gravity model parameter	Trip Length	Link Volumes	Intrazonal Trips
Low	High	High	Low
High	Low	Low	High

Trip Distribution

- ◆ Trip length

<u>Purpose</u>	<u>Large Pop.</u>	<u>Small Pop.</u>
HBW	15-20 min	7-10 min
HBO	13-17 min	6-9 min
NHB	13-17 min	6-8 min

Trip Distribution

- ◆ Trip length

HBW $t=0.98*pop^{0.19}$

HBRec $t=2.18*pop^{0.12}$

HBS $t=8.1$

NHB $t=0.63*pop^{0.20}$

Trip Distribution

- ◆ Employment distribution problems

- Low income households
- High income jobs

- ◆ Recommend additional trip purpose

Traffic Assignment

- ◆ Capacity troubles

Link Capacity	Speed	Travel Times	Assigned Volume
Low	Low	High	Low
High	High	Low	High

External Stations

- ◆ Percentage of trips

Population	% E-E trips
50,000-100,000	21
100,000-250,000	15
250,000-750,000	10

Model Adjustments

- ◆ System-wide
- ◆ Major movement
- ◆ Link

System-wide Adjustments

- ◆ Based on screenlines
 - Automobile occupancy rates
 - Trip generation rates
 - Trip lengths
 - Intrazonal times
 - Socioeconomic data

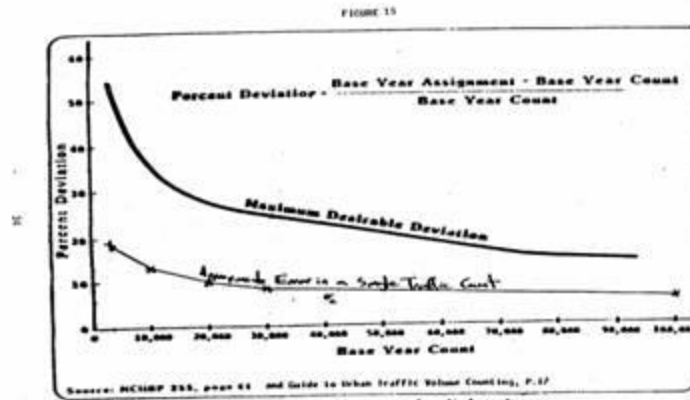
Major Movement Adjustments

- ◆ Based on cutlines
 - Land-use data for zones
 - Centriod connector placement
 - Intrazonal travel times

Link Adjustments

- ◆ Individual link validation
 - Speeds and capacities
 - Centriod connector locations
 - Special generator
 - Network configuration

Expected Accuracy



Caution: Traffic counts contain significant error

Percent Error

- ◆ Region-wide - <5%
- ◆ Functional class
 - Freeways - <7%
 - Arterials - <10-15%
 - Collectors - <25%
- ◆ Correlation coefficient >0.88

VMT Errors

- ◆ Region-wide - <5%

- ◆ Functional Class

	Small	Large
■ Freeway	18-23%	33-38%
■ Arterial	37-43%	27-33%
■ Collector	12-15%	8-12%

VMT Errors

- ◆ Per person
 - 17-24 miles (large area)
 - 10-16 miles (small area)
- ◆ Per household
 - 40-60 miles (large area)
 - 30-40 miles (small area)

Conclusions

- ◆ Be careful about making changes
- ◆ Make the correct changes
- ◆ Justify changing model parameters
- ◆ Remember real-world conditions

Calibration and Validation of Des Moines TRANPLAN Model

Michael Anderson, Civil Engineering

Presented for the Alabama
Transportation Planners Association

Run Model (Default Values)

- ◆ Open DSM.APR project on your computer
- ◆ Show travel model in ArcView GIS
- ◆ Examine information

Check Network Characteristics

- ◆ Examine Speeds and Capacities
- ◆ Use ArcView to check
 - Speeds
 - Capacities
 - Lengths
 - Socioeconomic data
- ◆ Thematic Maps

Check Region-wide Measures

- ◆ Trip generation values
- ◆ Trip lengths
- ◆ Trips/person
- ◆ VMT/person

Trip Information

Trip data from RUNX.OUT

	TRIPS	TRIP-HOURS	AVE. LENGTH	VARIANCE	STD. DEV.
PURPOSE NO. 1	230391	43502	11.329	37.916	6.158
PURPOSE NO. 2	384008	52965	8.276	29.828	5.461
PURPOSE NO. 3	368612	37293	6.070	18.772	4.333
PURPOSE NO. 4	63095	7641	7.266	31.521	5.614
PURPOSE NO. 5	133388	40486	18.211	34.286	5.855

Trip Generation Comparison

```
* UAG - URBAN/SYS          DES MOINES 1-235 ** GRAVITY MODEL ** 1990 TRIPS
  RUN-13                   PAGE NO.    2
TRANPLAN SYSTEM           1 = WORK  2 = OTHER  3 = NHB  4 = COMM VEH  5 = EXT-INT

VERSION 8.0

PURPOSE 1 INPUT ATTRACTIONS ( 188559) ADJUSTED TO INPUT PRODUCTIONS ( 230391)
PURPOSE 2 INPUT ATTRACTIONS ( 607321) ADJUSTED TO INPUT PRODUCTIONS ( 384008)
PURPOSE 3 INPUT PRODUCTIONS = ATTRACTIONS = 368612
PURPOSE 4 INPUT PRODUCTIONS = ATTRACTIONS = 63095
PURPOSE 5 INPUT ATTRACTIONS ( 60538) ADJUSTED TO INPUT PRODUCTIONS ( 133388)
```

Check Balancing Factors? Not within 10%!

Trip Lengths By Purpose

RUNX.OUT File.

TRIP LENGTH FREQUENCY DISTRIBUTION GRAVITY MODEL

MINUTES	PURPOSE NO. 1		PURPOSE NO. 2		PURPOSE NO. 3	
	TRIPS	PERCENT	TRIPS	PERCENT	TRIPS	PERCENT
1	2487	1.08	9388	2.44	28212	7.65
2	4895	3.20	18361	7.23	40679	18.69
3	6879	6.19	22787	13.16	42012	30.30
4	9632	10.37	35032	22.28	45664	42.69
5	13767	16.35	49504	35.17	46843	55.40
6	15545	23.09	49033	47.94	38217	65.77
7	16832	30.40	38643	58.01	27710	73.28
8	17019	37.79	28583	65.45	20744	78.91
9	17148	45.23	22097	71.20	14881	82.95
10	16280	52.30	16474	75.49	12927	86.46
11	14277	58.49	13979	79.13	10183	89.22
12	13162	64.21	12392	82.36	8547	91.54
13	11387	69.15	9817	84.92	6710	93.36
14	10175	73.56	8579	87.15	5520	94.86

Trip Lengths By Purpose

- ◆ HBW $t=11.08$ minutes (11.3 minutes)
- ◆ HBO $t=8.1$ minutes (8.3 minutes)
- ◆ NHB $t=8.09$ minutes (6.1 minutes)

Question about Friction Factors?

Trips Per Household

- ◆ Examine trips per household
- ◆ Des Moines 90,000 households
- ◆ 1,179,494 trips
- ◆ 13.1 trips per household

Trips Per Person

- ◆ Examine trips per person
- ◆ Des Moines 300,000 people
- ◆ 1,179,494 trips
- ◆ 3.9 trips per person

VMT Per Household

- ◆ LOADX.OUT file

```
TOTAL VEHICLE-MILES = 6056809.  
TOTAL VEHICLE-HOURS = 194153.  
AVERAGE SPEED = 31.20
```

67.3 miles per household

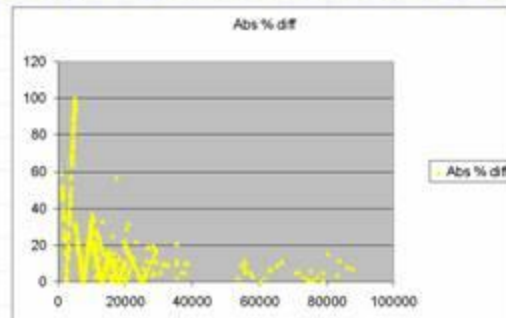
20.2 miles per person

Screenlines and Cutlines

- ◆ Use ArcView tool
- ◆ Generate information
- ◆ Determine system-wide or major movement adjustments

Link Comparisons

- ◆ Develop expected accuracy chart



VALID.XLS

Percent Error

- ◆ Total count

model	count	% Diff
13793424	14223500	-3.0237

- ◆ Functional Class

- Examine ArcView values
 - ◆ LG1>4 freeways and arterials
 - ◆ LG2>0 freeways

Percent VMT Error

- ◆ Total count

model	count	% Diff
4148130	4296845	-3.46

- ◆ Functional Class

- Examine ArcView values
 - ◆ LG1>4 freeways and arterials
 - ◆ LG2>0 freeways

Conclusion

- ◆ Be careful about making changes
- ◆ Make the correct changes
- ◆ Justify changing model parameters
- ◆ Remember real-world conditions

APPENDIX B

GIS – Tranplan Interface Project Documentation

ArcView Geographic Information System

Appreciation is expressed to Dr. Reginald Souleyrette of Iowa State University for providing input and content for portions of Appendix B. Dr. Souleyrette conducted a project, similar to UTCA project 99328, for the Iowa Department of Transportation.

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1. Introduction and Overview:

Welcome to the Iowa Department of Transportation's ArcView based GIS-Tranplan Interface program. The program was designed to be useful as well as user-friendly. To assist you the user in becoming familiar and comfortable with the interface program, we suggest you read through this user's manual, and keep it handy during the use of the programs. Other useful materials include a Tranplan and ArcView user's manual.

1.1 Program Objectives

The objective of this software is to provide a convenient method for transferring travel models and their data between ArcView and Tranplan. Once this task is completed, the interface will allow the use of a selection of planning and analysis tools on the completed model. By automating formerly labor-intensive steps, the interface reduces user's computer time, improves file management, and assist in visualization of the traffic network data.

A key addition to the ArcView-Tranplan Interface is the help-sensitive tool tips added to non-ArcView input windows. Through the use of Visual Basic programming, the user is given reference locations in either the Tranplan manual or the interface user's manual for information regarding required input.

1.2 Questions Concerning the Interface

Listed below are frequently asked questions and answers relating to the use and usefulness of the interface.

I have the Software, Where Do I Start? The section entitled How Do I Get Started, Page 7 of the documentation, details the procedure of copying the required files into a program file directory named TPAVtools. Once this is done, a working directory should be created for each model scenario. After placing all applicable data files (Table 1-1), along with the provided ArcView project (*Arc_tp.apr*), into the working directory, the user is ready to begin the process.

The Software is Installed, How do I Start the Process? To begin the modeling process, a network must exist or be created. If the working directory has both a links data file and a nodes data file that are properly formatted for Tranplan use (see figures 4-7 and 4-8 for examples), then by using the Network-*"Create a Tranplan Network"* pull-down menu option, the interface will begin the modeling process. See section 4.2 Create a Tranplan Network for more details. A second option for beginning the process is to create a network in ArcView. Section 4.3, Create a New Network describes the steps for using this option.

My Tranplan Network Data is Not Formatted Like the Example Files. Tranplan requires proper data format. This formatting is of column delimited text form, which means that each column in the data file is reserved for a certain data set. For example, columns one through five may be reserved for a node number. Therefore, all numbers that are in columns one through five are considered to be part of the node number, even if there happen to be letters, spaces, etc. in these columns. When Tranplan tries to read these columns, an error will be generated when the data is incorrectly formatted. Therefore, references to the Tranplan user's manual are supplied to assist in the correct formatting of data.

I have the Network, now What Do I Do? By using the Tranplan-*"Model Run"* pull-down menu, the interface will begin the modeling process. After the user completes the input windows, the interface will proceed through the modeling process. See section 5.1 for more details.

I have Tranplan output and would like to display this output. Can I do this? Yes, but the steps required depends upon what form the output is in. Listed below are a set of questions and required steps to display the Tranplan output.

Does an ArcView view called Network exist? If the Network view exists, go to the next step. If not, create a new view from the project window, then change the name to Network.

Is there a Links Data File in Tranplan Text Format? If you have a text file that contains only the Tranplan output for the links, then go to the next step. If the output is in binary form (has NOT been run through

Netcard), then using the Netcard Output Splitter program under Network>Netcard Output Splitter will convert the output into a usable form. If the Tranplan output has been run through Netcard, but the node and link data are in one file, either use a text editor to separate the data, or use the Netcard Output Splitter to properly format the data.

Do you have a *nodes.shp* file existing in your Network view? If a nodes shapefile exists, the Tranplan-“*Rejoin a Model Run*” pull-down menu option will allow you to select the Run Arc_Load option. If there is no *nodes.shp* file, the Tranplan-“*Rejoin a Model Run*” pull-down menu option directions will still work, however, an error will be created. The Arc_Load program attempts to create a centroid shapefile from the nodes shapefile. By canceling the error message and closing the _Centroid script window, the *ld_links.shp* file will have been created. See section 5.2 for more details.

How do I incorporate ground counts? There is a Counted field in the links attributes table. Add the ground counts in this field before running Tranplan. These values will be used in the validation tool.

Do I want to let the Interface Create a Tranplan Control File? If you are required to use an existing module for Tranplan, or you have a working knowledge of Tranplan and would like to write your own module, then select no. By doing this, some functions of the interface may not operate properly due to the absence of data files created during a default module run. Therefore, if the default module is not used, care must be taken to ensure that the proper files are saved for each of the Analysis Tools. See section 5.2.2 for details about required Tranplan functions.

Can I Use a Different Traffic Assignment Method? If you are familiar with Tranplan control files, you may want to use a traffic assignment method other than the equilibrium method used in the default control file. To do this, select No when prompted if you would like the interface to create a Tranplan control file. When prompted if you would like the interface to run Tranplan, choose Yes. Finally, the interface will prompt for which control file to use. Select the user created option and enter your control file’s name.

There is a New Layer Called *Ld_links.shp*. What happens next? The *Ld_links.shp* layer is the same visual layer as the *links.shp* file. However, the *Ld_links.shp* table contains the output from Tranplan, known as the loaded network. This loaded network contains the speeds and capacities that make up the model when all trips have been generated and distributed. The creation of *Ld_links.shp* is the last step of the modeling process.

I’ve Made a Mistake, Can I Go Back? Yes, by using the Model-“*Join a Model Run*” pull-down menu tool, the interface allows you to go back to any part of the modeling process and repeat the entire procedure from the point where the interface program is returned to. Section 5.2 describes the Join a Model Run options.

The Model Requires Validation and Calibration. How Do I Do This? By using the Screen/Cut Line, Visualization Plot, and Calibration Plot Analysis Tools, a regional or link by link comparison between ground counts and loaded volumes can be used to determine the accuracy of the model. Then the user can make appropriate changes in the links, nodes, parameters or input data and re-run the process.

What Do the Different File Extensions Represent? Several different file extensions are utilized in the interface to distinguish between different formatting types. The table below gives a description of what the various extensions represent.

Table 1-1 File Extensions

*.bat	DOS batch file used to execute DOS commands internally.
*.bin	Binary files store data in a computer format.
*.dat	Data files are column delimited text files, following Tranplan formatting restrictions.
*.dbf	ArcView file extension for attribute tables.
*.geo	Text files that place string variables in a string format. Used as ArcView input.
*.pa	Text files that follow *.dat restrictions. *.pa files store production/attraction data.
*.shp & *.shx	ArcView shapefiles.
*.txt	Standard comma delimited text files.

1.3 Definitions

Listed below is a set of terms that help describe the workings of the interface.

Loaded Network – The output from Tranplan that includes the speeds and capacities on the links in the network when the trip assignment has been completed. This network is identical in graphical appearance to the unloaded, or original network. However, the links in the network have had the Tranplan data added into the original data.

Model – Included in a model is the scenario's network, along with all data that is used to assist the user in making decision concerning the scenario.

Network - Defined by the Tranplan user's manual as: A description of the network in terms of "nodes" and "links". Nodes define a given point of physical location within the study area. Each node must have a unique number, and if plotting or graphic display is desired, each node must be assigned an (x,y) coordinate pair. Links define a section of roadway or transit right-of-way between two nodes, and the attributes such as speed and capacity, that are to be associated with the link.

Scenario - As part of the program package, this interface allows the user to have multiple models running at one time. In addition, the same basic project can be opened and edited without having to close the original project. Therefore, each version of the interface that is running is called a scenario. These scenarios may be completely separate models, identical models with minor editing to the network, or exactly the same network. By setting each scenario in a unique working directory, no data sharing issues should arise.

Screenline – A user –defined line that crosses links in the loaded network in order to assist in the validation process. These lines can be drawn to aid in local, regional, or network wide validation. To use a screenline, draw a line to cross several links. By comparing the loaded volumes on similar links that intersect the screenline, numerous errors can more easily be identified visually.

Traffic Analysis Zone (TAZ) - A designated area where productions and attractions have been assigned for use in the scenario's model. For input in the interface, the number of TAZ's includes both the internal and external TAZ's.

Turn Penalty - A value assigned to a turning movement that begins at the origin or A node, goes through the turning or B node, and terminates at the destination or C node. This value represents the number of minutes a turning vehicle must wait before making the turn, divided by 100. For example, a value of 70 would indicate that a turning vehicle must wait 0.70 minutes before an adequate gap in oncoming traffic occurs, allowing the vehicle to execute the desired turning movement. This value is part of a turn file, described in the Default Module Builder section of this manual. For more information see also the Tranplan user's manual in the Loading section, page 4-11.

Turn Prohibitor - A line of data that indicates that a particular turning movement cannot be performed. The syntax is similar to that of a turn penalty file, however, no value is entered in the last column. This file is described in more detail in the Arcnet section of this manual. For more information see also the Tranplan user's manual in the Network section, page 1-9.

2. How to Use this Manual:

As you work through the GIS-Tranplan Interface, there is a sequence of events that must be carried out in order for the process to be successful. In Appendix A there is a flowchart that shows the required sequence for displaying a network in an ArcView view and a second flowchart for completing a model run. Each process in the flowchart has a chapter associated with it. By identifying the process on the flowchart, then finding the corresponding chapter in this user's manual, the user can review an in-depth discussion on each segment of the interface program.

Font Descriptions: This manual uses different font styles to indicate that the phrase in question belongs in a distinct descriptive category.

Italics – Indicates that the phrase is the name of a file used by the interface.

Bold – Indicates that the phrase is the title of an input box located on an input window in the interface program.

“Italic Quotes” – Indicates the name of a pull-down menu option.

3. Getting Started:

3.1 Setting Up the Directory Structure

Using the interface requires a directory to store the data files for each model scenario and second directory to store the Visual Basic executables and other files needed to run the interface. For the directory in which the Visual Basic programs are stored, it is recommended that the folder be on the computer's hard drive and named “C:\TPAVtools”. It is not necessary that this folder be stored on the hard drive or use the recommended name as it is possible to specify a unique path each time the ArcView project is opened. For the data directory, keeping the path under thirty characters will allow ArcView to execute the Tranplan model run. If the path name exceeds thirty characters, then one must complete the Tranplan run manually.

3.2 Downloading & Installing the Software

One version of the Tranplan-ArcView interface is available; it interacts with both Tranplan 8.0 and Tranplan 9.0. This download contains a self-extracting zip file that will expand the Visual Basic programs and install several DLL files onto the computer's hard drive. To download the software, go to the project's homepage at http://www.ctre.iastate.edu/Projects/tp_is/Enhance/Web/download.html.

After the self-extracting zip file has been saved, follow the instructions below to install the programs.

1. Click on the link.
2. Choose the option SAVE FILE. It is recommended that the self-extracting zip file be saved to a temporary directory (i.e., C:\temp).
3. Double click on the self-extracting zip file.
4. If not already the default, set the extraction location to the same folder of the self-extracting zip file.
5. Press (“EXTRACT” or “UNZIP”).
6. After all files have been extracted, double click on “Setup.exe”. Carefully read and follow the instructions on each help screen. Note that the default location where the program is going to be installed at. It is suggested that this default location be changed to a recognizable folder on the local drive (i.e., C:\TPAVTools).
7. After completing Setup.exe, all the needed files are stored in a single directory, including the provided ArcView project, Arc_tp.apr, along with a data folder containing all required files to run a demo model.
8. Place a copy of the ArcView project, Arc_tp.apr, in each model scenario's working directory.

3.3 Opening the ArcView Project

Once all data files and the *Arc_tp.apr* file are placed in the working directory, start ArcView and then open the project *Arc_tp.apr*. The *Arc_tp.apr* project is the working ArcView project for the interface. The interface will cause ArcView to add new pull-down menu options. Figure 3-1 shows the ArcView toolbar after opening *Arc_tp.apr*. Also upon opening the ArcView project, three prompts will appear to verify the Visual Basic tools directory, Tranplan directory, and the ArcView working directory. The default directories can either be accepted if correct or changed if needed.



Figure 3-1 ArcView Enhanced Pull-Down Menu

3.4 Files Needed to get Started

If a Tranplan network already exists in ASCII text format, then a copy of several different files should be placed in the model scenario's working directory along with the ArcView project, *arc_tp.apr*. A list and description of the required data files is located in Table 1-1.

Table 3 – 1 Required Data Files

File Name	File Description
<i>Arc_tp.apr</i>	ArcView project containing the Tranplan interface.
<i>Ext.dat</i>	External data file for Default Module Builder, see Figure 5-10.
<i>Friction.dat</i>	Friction data file for Default Module Builder, see Tranplan user's manual, Models section, page 1-7, or Figure 5-11.
<i>Gm.pa</i>	Gravity Model Production/Attraction File for Network Data User Input form, see Figure 4-9 ^C
<i>Pro.txt</i>	Production file ^C
<i>Att.txt</i>	Attraction file ^C
<i>Links.dat</i>	Links data file for Network Data User Input form, see Figure 4-8.
<i>Nodes.dat</i>	Nodes data file for Network Data User Input form, see Figure 4-7 ^B
<i>Turn.txt</i>	Turn prohibitor only file for Arcnet, see Figure 5-6. ^A
<i>Turnpenpro.txt</i>	Turn penalty/prohibitor file for Default Module Builder, see Figure 5-9. ^A

A. The scenario's network may not have any prohibited turns; therefore, it is possible to omit these files.

B. Required only if using Network Data User Input form. New Network requires only *links.dat*.

C. A production/attraction file is required, however, the productions and attractions may be in separate files, then merged during the interface's process. The maximum number of trip purposes allowed by the interface is ten, however, only one purpose is required.

4. Using the Interface: View a Network –“Network”

To begin the modeling process, a network needs to be created. To accomplish this, the user can select one of three options from the Network pull-down menu (see Figure 4-1). The first option, “*Format Netcard Output*”, creates properly formatted node, link, and turn prohibitor ASCII text files for creating a Tranplan network. The second option, “*Create a Tranplan Network*”, uses existing Tranplan ASCII text files to produce the scenario’s network. The third option, “*Create a New Network*”, is for when there is no pre-existing text file and one wants to create a new network directly in ArcView. One of the last two options must be selected in order to proceed with the modeling process.

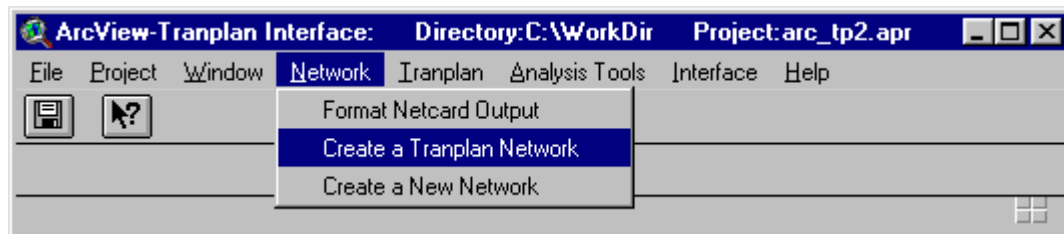


Figure 4-1 Network Options

4.1 Netcard Output Splitter –“*Format Netcard Output*”

Description: The Format Netcard Output option splits the output from Tranplan’s binary to text conversion program, Netcard, into separate node, link, and turn prohibitor files. To accomplish this, Netcard is executed to allow the user to convert a network file from a binary file to an ASCII text file. Then the user is prompted to specify the names of the node, link, and turn prohibitor files to be output. Text files containing Tranplan formatted data to be used in the network building process are output.

Quick Instructions:

1. Select the menu option Network>Format Netcard Output
2. Type the name of the network binary file, including entire filename.
3. Enter the name of the output file, including entire filename. (Use *Net.dat* as the default.) If Netcard ends at this point, then *Net.dat* already exists in the working directory. Verify that the version of *Net.dat* that exists is correctly formatted. If so proceed to step 10.
4. Verify that speeds are to be used rather than time by typing Y.
5. Enter the speed conversion factor. (Use 1 as the default)
6. Enter the loaded volume conversion factor. (Use 1 as the default)
7. Type N to avoid appending COST data to the end of the file.
8. Type N for all one-way links.
9. Type N to avoid placing headers in the output. If inputs are entered correctly, Netcard will close at this point.
10. Press Yes to continue.
11. Fill in the text boxes in the window titled “Netcard Output Splitter”, Netsplit.exe.
 - A. Change the name of the netcard output file if the default is incorrect.
 - B. Change the name of the nodes data file if the default is incorrect.
 - C. Change the name of the links data file if the default is incorrect.
 - D. Change the name of the turn prohibitor file if the default is incorrect. If no turn prohibitors exist, no file is created, regardless of the input file name.
12. Press Continue.

Description: By selecting the “Format Netcard Output” option of the Network pull-down menu, Tranplan’s binary to text converter program, Netcard.exe is called. Figure 4-2 shows the required inputs and the default replies to each requested input.

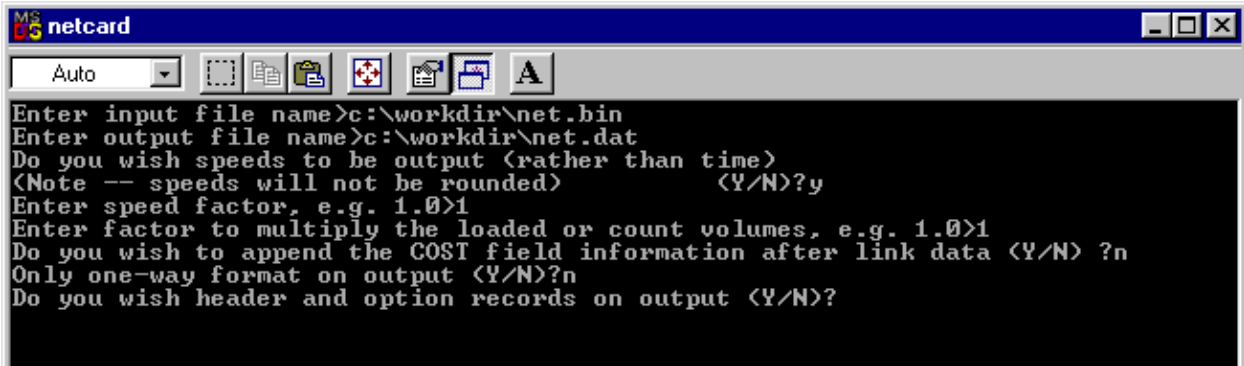


Figure 4-2 Netcard Example

Input (User): After completing the Netcard operation as shown above and selecting Yes to continue, the Netcard Output Splitter screen is displayed. Netcard Output Splitter (see Figure 4-3) requires the user to input the name of the Netcard output file, along with the names of the node, link, and turn prohibitor files. The first input box (Input the Name of the Netcard Output File) prompts the user to input the name of the output file from Netcard. This text file will contain the node, link, and turn prohibitor information for the network. A portion of this file with the default name of *net.dat* is shown in Figure 4-4. The second input box (Please Specify the Name of Nodes data file) requires the user to enter the name that the formatted nodes data file will be saved as. The default name is given as *Nodes.dat*. An example of the output file, *Nodes.dat*, is shown in Figure 4-7. The third input box (Please Specify the Name of the Links data file) prompts the user to enter the name that the formatted links data file will be saved as. *Links.dat* is given as the default filename; Figure 4-8 shows an example of the link file. The last input box (If the Netcard Output contains Turn Prohibitors, Please Specify the Name of the file) requires input only when the network contains turn prohibitors. No file will be created if the Netcard output file contains no turn prohibitors. If turn prohibitors do exist in the Netcard output, than the user must enter the name that the formatted turn prohibitor file will be saved as. Entering a turn prohibitor filename when no turn prohibitors exist in the output will not generate an error. An example of a turn prohibitor file is shown in Figure 5-9.

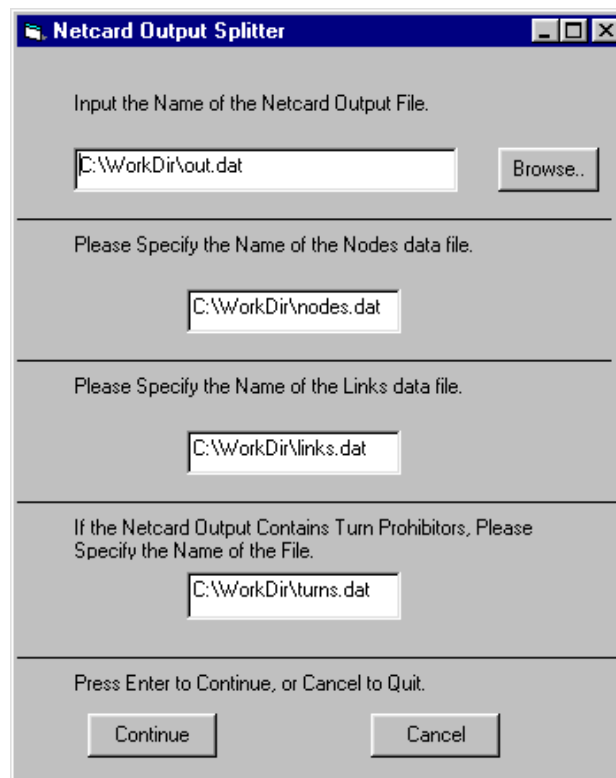


Figure 4-3

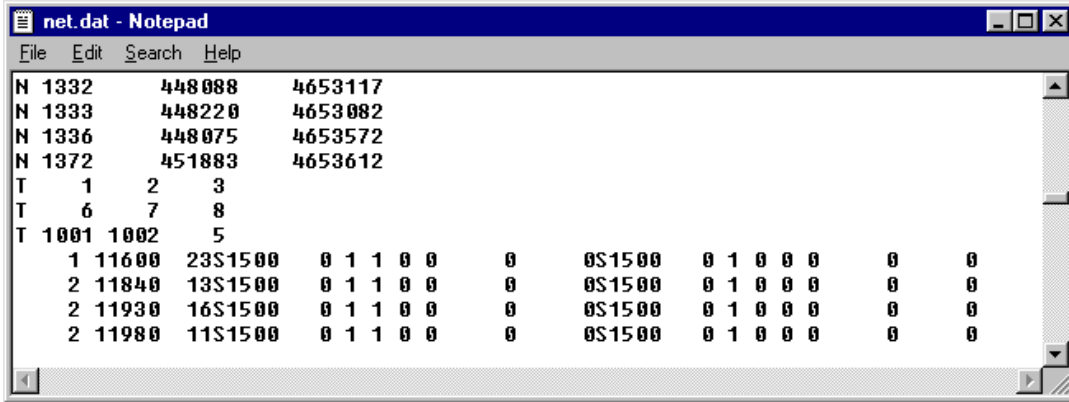


Figure 4-4 *net.dat* Example

Output: The Netcard Output Splitter produces Tranplan formatted text files containing node, link, and turn prohibitor data respectively. These output files can then be used with the “Create a Tranplan Network” option to recreate the network as mappable shapefiles in ArcView.

4.2 Tranplan Text Network – “Create a Tranplan Network”

Description: The Network Data User Input form allows the user to convert text files containing node and link data into mappable ArcView shapefiles. The input files must be in Tranplan format, and the number of TAZ’s must include both the internal centroids and the external stations.

Quick Instructions:

1. Select the menu option Network>Create A Tranplan Network
2. Fill in the text boxes in the window titled “Network Data User Input”, TP_ARC.exe.
 - A. Change in the name of the nodes data file if the default is incorrect.
 - B. Change in the name of the links data file if the default is incorrect.
 - C. Change in the name of the production and attraction data file if the default is incorrect.
 - If the production and attraction data are in separate files, click MERGE (Figure 4-6).
 - Use the BROWSE button to enter the name of the production data file.
 - Use the BROWSE button to enter the name of the attractions data file.
 - Click ENTER, will create production and attractions file called *combgm.pa*.
 - D. Enter the number of TAZs, including the external stations.
 - E. Change the X and Y coordinate conversion factors if other than one.
 - F. Choose the Tranplan coordinate system used for the nodes data file.
 - G. Press OK.
3. Press YES if Network Data User Input executes properly.
4. Several status boxes will appear, click OK to continue.
5. To incorporate ground counts of traffic, highlight the links attributes table, select the “counted” field, activate the *link.shp* theme, select a link in the “Network” view with the select link tool, then press the calculate button to add the ground count value.

Input (User): The Network Data User Input form (see Figure 4-5) prompts the user to input both data and network data files. The first input (**Input the name of the nodes file**) prompts the user to identify the data file containing the nodes data for the particular scenario that the user opened the ArcView project in. A default file name, *nodes.dat*, is given in the file name box, and a browse button allows the user to search for the file if the given default name is incorrect. The

same procedure is used for identifying both the links data file (**Input the name of the links file**), default value of *links.dat*, and the productions and attractions file (**Input the name of the productions and attractions file**), default value of *gm.pa* for the network. If the production and attraction data is stored as separate files, use the merge function, see Figure 4-6, to combine the two files into *combgm.pa*. The fourth user input box is for inputting the number of Transportation Analysis Zones (TAZs) (**Input the number of TAZs and external stations**). This number is to include both the interior and exterior zones for the particular project scenario. No default is given, therefore the user should have some working knowledge of the project scenario network. The value entered in this box will become the default value for succeeding programs, so care in entering the correct value should be taken here. Next are the input boxes that ask for the coordinate conversion factors. The input box on the left of the input window, labeled the (**Input the x coordinate conversion factor**) allows the user to alter the physical size of the network by scaling the entire network in the x direction. The default value for the x coordinate factor, 1, is given. The input box on the right, (**Input the y coordinate conversion factor; 1**), allows for the same type of scaling in the y direction. The final input box (**Choose the proper Tranplan coordinate system**) allows the user to decide whether the network scenario's coordinates are stored in large or small coordinates. Tranplan stores the coordinate data in either a five digit or nine digit variable, therefore, selecting the incorrect coordinate system will cause a system error of this interface.

Figure 4-5 Network Data User Input Form

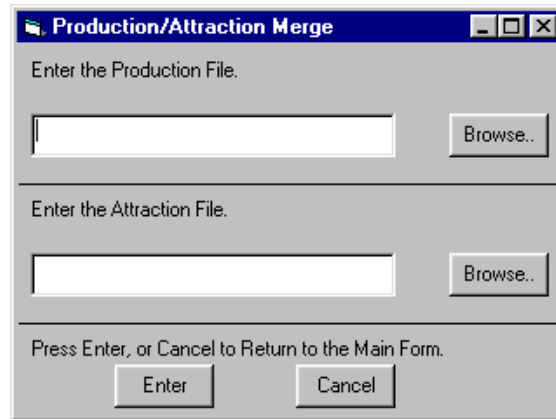


Figure 4-6 Production/Attraction Merger Form

Below is a sample of how each of the input files should be formatted (see Figures 4-7 through 4-9). Tranplan demands data is formatted so as to exist in a particular column, or range of columns. Consult the Tranplan user's manual for more information on input data formatting.

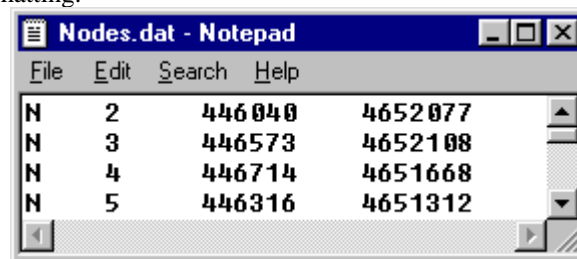


Figure 4-7 Nodes.dat Example

See the Tranplan User's Manual, Networks section, page 1-9 (large coordinates) for more details on proper formatting.

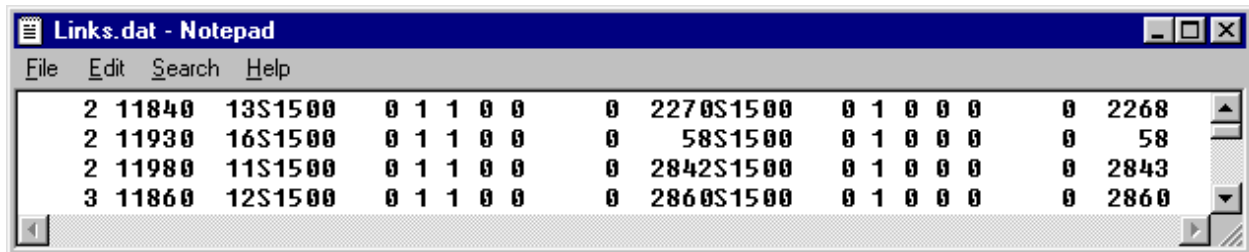


Figure 4-8 Links.dat Example

See the Tranplan User's Manual, Networks section, page 1-11 for more details on proper formatting.

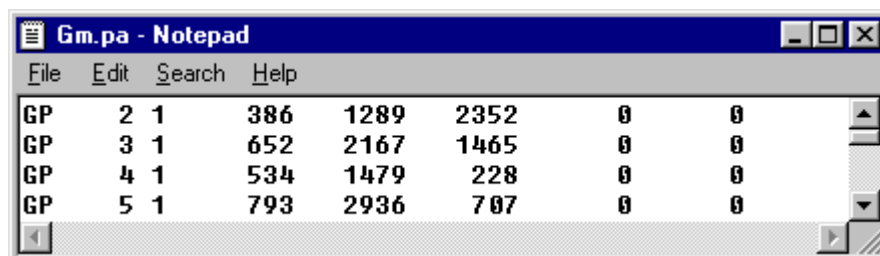


Figure 4-9 *Gm.pa* (Gravity Model Production/Attraction) Example

See the Tranplan User's Manual, Models section, page 1-8 for more details on proper formatting.

Please note that this interface requires the use of no more than ten productions or attractions. If fewer than ten productions or attractions exist, the Interface will fill remaining production and attraction columns with zeros to produce exactly ten productions and ten attractions. The new file will be named *Newgm.pa*, and should be used whenever a production/attraction file is required by the Interface. See the Tranplan user's manual, Model section, page 1-7 for more details.

Input (Default): The Network Data User Input form requires that the directory tree file, *dirtree.txt*, contain the file name of the working directory. The working directory needs to contain all data files, and will be the destination of all output files created. Shown below is an example of a directory tree file (Figure 4-10).

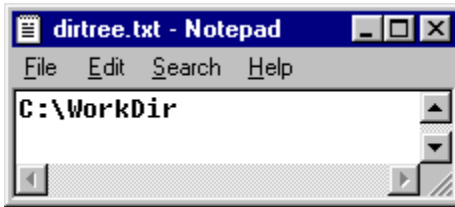


Figure 4-10 Directory Tree File Example

Output: The Network Data User Input form produces both hidden and visible file outputs. The visible files are the *nodes.geo* file (Figure 4-11) and *links.geo* file (Figure 4-12). These files, which are written into the default working directory of the current project scenario, are used by ArcView to create shape files of both the nodes and links that make up the scenario's network. The hidden file that is created holds the number of TAZ's that were input into the program by the user. This file, also stored in the default directory, is *taz.txt* (Figure 4-13). Below are examples of the output files from the Network Data User Input form.

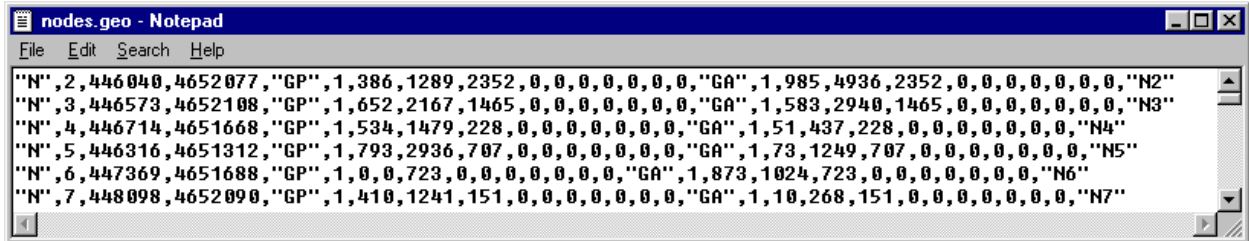


Figure 4-11 *Nodes.geo* Example

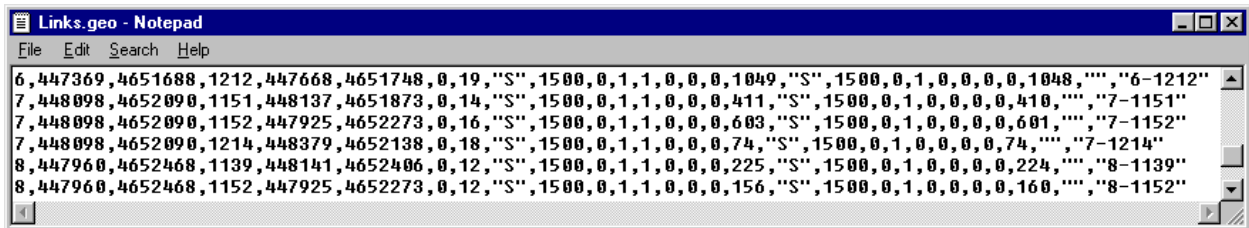


Figure 4-12 *Links.geo* Example

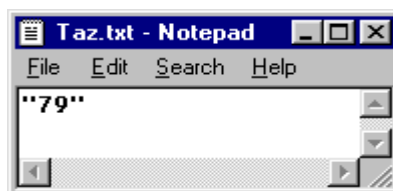


Figure 4-13 *Taz.txt* Example

Once the Network Data User Input form is completed, the script will ask the user whether to continue or not. By selecting Yes, the interface will continue creating the scenario's network. Selecting No will terminate the progress of the interface, but will not delete any data, or prohibit any future usefulness of the interface to the scenario. Figure 4-14 shows an example of an avenue continue box. The script will then convert the geo files into shape files. Both the nodes and links files are converted, and are named *nodes.shp* and *links.shp* respectively. A splash screen, similar to Figure 4-15, will appear at the conclusion of each file conversion. Figure 4-16 shows an example of a *nodes.shp* attributes table, while Figure 4-18 shows *links.shp*. Finally, the shape files are loaded into the Network View screen, similar to Figure 4-18.

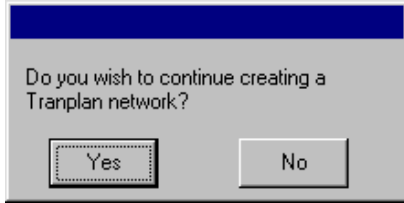


Figure 4-14 Avenue Continue Box

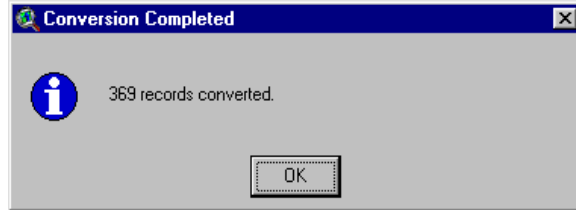


Figure 4-15 File Conversion Splash Screen

Station	N	X coordinate	Y coordinate	Grp	Sp	gpn	Prod_1	Prod_2	Prod_3	Prod_4	Prod_5	Prod_6	Prod_7	Prod_8	Prod_9	Prod_10	Grp	Sp	gpn	Attr_1	Attr_2	Attr_3	Attr_4	
1	"N"	446578	4653023	"GP"	1	0	0	5824	0	0	0	0	0	0	0	0	"GA"	1	6155	9065	5824			
2	"N"	446040	4652077	"GP"	1	386	1289	2352	0	0	0	0	0	0	0	0	"GA"	1	985	4936	2352			
3	"N"	446573	4652108	"GP"	1	652	2167	1465	0	0	0	0	0	0	0	0	"GA"	1	583	2940	1465			
4	"N"	446714	4651668	"GP"	1	534	1479	228	0	0	0	0	0	0	0	0	"GA"	1	51	437	228			
5	"N"	446316	4651312	"GP"	1	793	2936	707	0	0	0	0	0	0	0	0	"GA"	1	73	1249	707			
6	"N"	447369	4651688	"GP"	1	0	0	723	0	0	0	0	0	0	0	0	"GA"	1	873	1024	723			
7	"N"	448098	4652090	"GP"	1	410	1241	151	0	0	0	0	0	0	0	0	"GA"	1	10	268	151			
8	"N"	447960	4652468	"GP"	1	150	453	47	0	0	0	0	0	0	0	0	"GA"	1	1	85	47			
9	"N"	448338	4652440	"GP"	1	126	381	251	0	0	0	0	0	0	0	0	"GA"	1	284	390	251			
10	"N"	448652	4652100	"GP"	1	0	0	1181	0	0	0	0	0	0	0	0	"GA"	1	2149	1678	1181			
11	"N"	449177	4652106	"GP"	1	156	512	2454	0	0	0	0	0	0	0	0	"GA"	1	1940	4396	2454			
12	"N"	449344	4651760	"GP"	1	754	2475	1390	0	0	0	0	0	0	0	0	"GA"	1	786	2511	1390			

Figure 4-16 Portion of Nodes.shp Attributes Table

Counted	A_node	Ax_coord	Ay_coord	B_node	Bx_coord	By_coord	Assgn_grp	Distance	Ab_field_o	Ab_speed_1	Ab_speed_2	Ab_directi
1000	1002	448678	4658391	1003	448461	4657131	0	80	"S"	5500	0	
2000	1003	448461	4657131	1004	448656	4656033	0	69	"S"	5500	0	
0	1005	453054	4657624	1006	452789	4653538	0	255	"S"	5500	0	
0	1006	452789	4653538	1256	452712	4651074	0	154	"S"	6500	0	
0	1254	451882	4652246	1008	453290	4652259	0	87	"S"	4500	0	
0	1008	453290	4652259	1009	458475	4652244	0	321	"S"	5500	0	
0	1010	458454	4650651	1011	453990	4650681	0	277	"S"	5500	0	
0	1013	449427	4646139	1014	449475	4643010	0	179	"S"	6500	0	
0	1004	448656	4656033	1015	447869	4656016	0	49	"S"	5000	0	
0	1015	447869	4656016	1016	447414	4656020	0	28	"S"	5000	0	
0	1016	447414	4656020	1017	446159	4656007	0	78	"S"	5000	0	
0	1017	446159	4656007	1018	445456	4653140	0	90	"S"	4000	0	

Figure 4-17 Portion of Links.shp Attributes Table

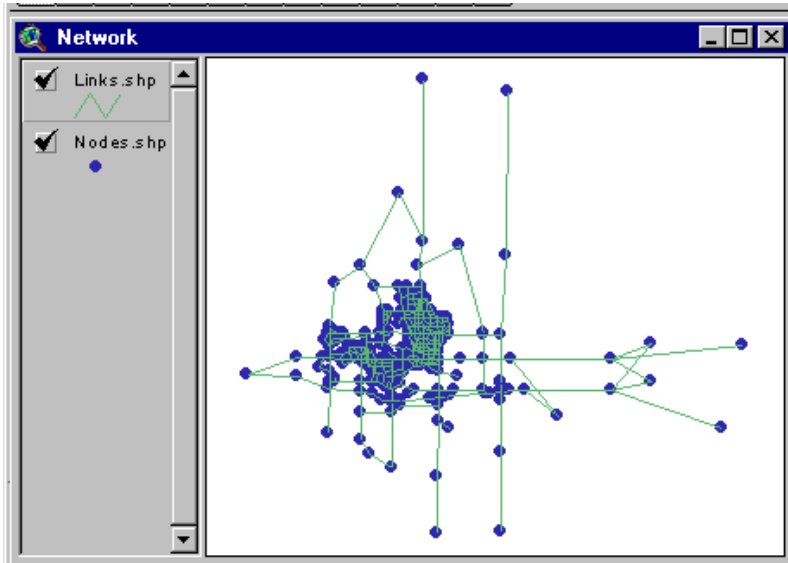


Figure 4-18 Network View Screen

4.3 ARCVIEW CREATED NETWORK - “CREATE A NEW NETWORK”

Description: If one wishes to create a new model for a city, the links and nodes data files can be created visually using ArcView. This option will create the nodes and links shapefiles with the proper fields, but will only contain node numbers, coordinates, and general speeds and capacities. Production and attraction data, detailed speeds and capacities, assignment groups, and link groups data will have to be entered into the proper field manually or through querying and joining with other data sources.

To help reduce mistakes (i.e., placement of nodes in the wrong place, not snapping the links together, and etc.) while creating the new network, one may want to first create several shape files that represent the desired network. Then while executing the application; the centroids, external stations, network nodes, and network links can be copied into the themes at the appropriate time. The first advantage to this method is that it will be easier to make changes to the network before running the application compared to while running the application. Also, one can start with an existing data source, such as TIGER line files, DOT cartography, or aerial photos. If the links and node networks are created in advance, none of the shape files should be named *Points.shp*, *Network.shp*, *Nodes.shp*, or *Links.shp* since these files will be created by the interface.

Quick Instructions:

1. Click on “**Create a New Network**” under the menu option “Network”.
2. Choose to draw the network in an open or new view.
 - If chose to use an open view, enter the name of the view. If the view is not already titled “Network”, then it will be renamed.
 - If chose not to draw the network in an existing view, then a view titled “Network” will be created.
3. Choose the desired option from the “Build a Tranplan Network” window. Start with **Locate Centroids** if no network has been developed. If part of a network has been developed, then start with the next step in the option list.
4. Click **OK**.
5. Place the internal centroids, use the “**Draw Point**” tool or copy them in from another theme.
6. Click on “**Register the Centroids**” button to continue.
7. Choose if dummy TAZs will be included in the network.
 - Enter the number of dummy TAZs if included in the network.
8. Place the external centroids, use the “**Draw Point**” tool or copy them in from another theme.
9. Click on “**Register the External Stations**” button to continue.
10. Place the network nodes, use the “**Draw Point**” tool or copy them in from another theme.
11. Click on “**Register the Network Nodes**” button to continue.
12. Place the links, use the “**Draw Point**” tool or copy them in from another theme.
 - The ends of the lines must be snapped together, but do not need to be snapped to the nodes.
 - The end of the lines should be placed as closely as possible to the nodes.
13. Click on “**Register the Network Links**” button to continue.
14. Click “**Yes**” to continue if Develop.exe executed without reporting an error.

Input (ArcView): After clicking on “*Create a New network*” under the menu option “*Network*”, a prompt will appear asking whether or not to draw the new network in an existing view (see Figure 4-19). If “**No**” is chosen, a new view titled “*Network*” will be created. In this view, the new network shall be created. If “**Yes**” is chosen, another prompt will appear asking for the name of the view (see Figure 4-20). **Type in the name of the view** if different than the default name. Click **OK** to continue. If the entered view is not already titled “*Network*”, than a window will appear warning the user that the view will be renamed to “*Network*” (see Figure 4-21).

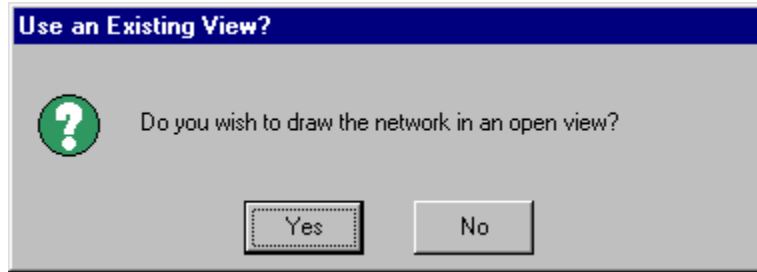


Figure 4-19

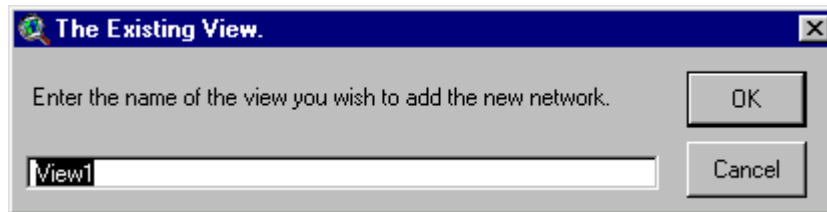


Figure 4-20

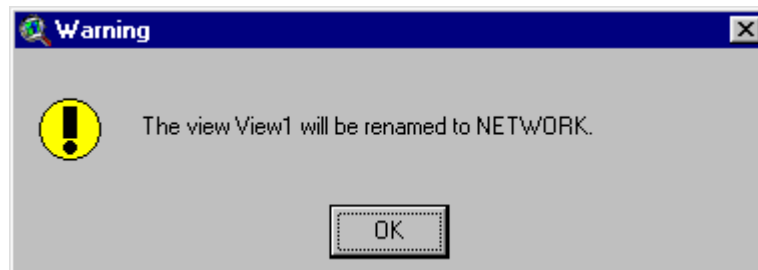






Figure 4-21

Once the view has been opened, the next step is to choose the desired option from the “*Build a Tranplan Network*” window (see Figure 4-22). If no part of a network is already created, then start with the option “**Locate Centroids**”. The application is designed so that the remaining three network components will be executed in order they are listed. If part of a network was created previously, then chose the appropriate option to start with. Again, note that the remaining network components will be executed in the listed order.

Before building each component of the model, a message box will appear providing some basic instructions. See Figure 4-23 for an example message box. To continue creating the new network, click “**OK**” at each instruction box.

To place the centroids in the *Points.shp* theme, click on the “**Draw Point**” button, . Place the cross hairs in the proper location in the view’s screen and then left click to draw the centroid in. At this time, centroids may also be added to the network by copying the nodes in from a separate theme. Once all centroids have been placed, click on “Register the Centroids” button, , to continue. A like procedure is used to add the external stations and network nodes. To continue after placing the external stations and network nodes, click on the “Register the External Stations” button, , and “Register the Network Nodes” button, , respectively.

After creating the internal centroids, a prompt appears asking if dummy zones are to be included between the internal and external zones (see Figure 4-24) to allow for future expansion of the model. If dummy zones are to be added, click on **Yes** and then enter the number of dummy zones (see Figure 4-25). If no dummy zones are desired, simply click **NO** at the prompt and then continue on with the application.

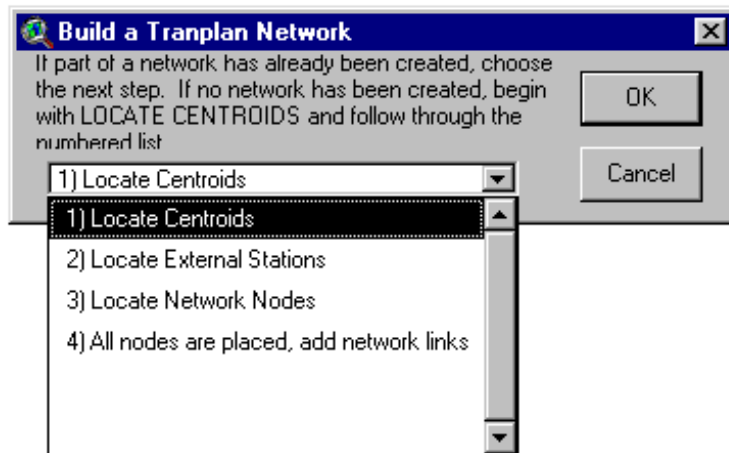


Figure 4-22

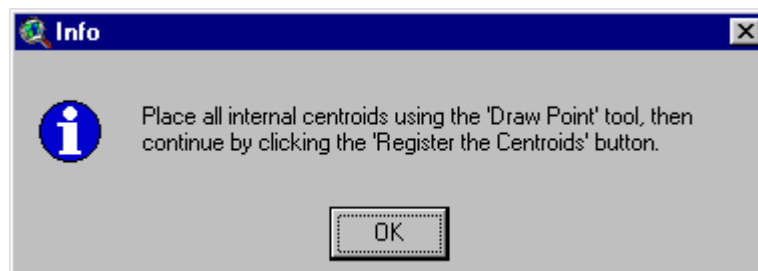



Figure 4-23

The final step is to draw in the network links and centroid connectors into the shape theme *Network.shp*. When adding the links, the endpoints of the lines do not need to be snapped to the nodes. If two links do share a common node, then the links must be snapped together. After all the links and centroid connectors have been added, click on the “Register the Network Links” button, .

After clicking on the “Register the Network Links” button, the data tables will be exported into a comma delimited text file. The Visual Basic program *Develop.exe* (see Figure 4-26) will then take both data files, find the closest node to the endpoints of the lines, assign node numbers to the end of the links and then populate the proper data fields. If *Develop.exe* executes without any errors, click “Yes” on the Avenue Continue Box (see Figure 4-14) to allow ArcView to draw the network.

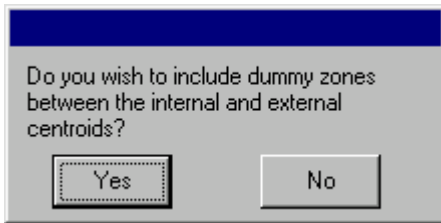


Figure 4-24

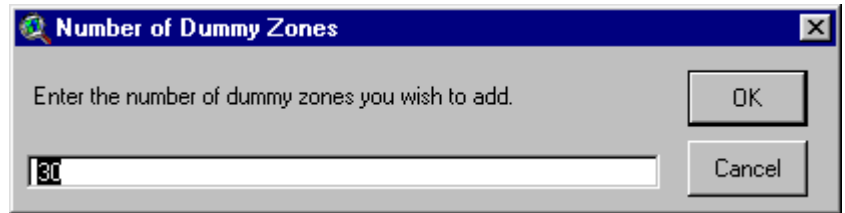


Figure 4-25

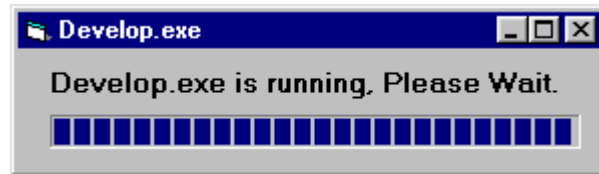


Figure 4-26

5. Using the Interface: Running Tranplan From ArcView – “Tranplan”

Once a network has been created in ArcView, the Tranplan modeling software can be utilized to create a loaded network. The pull-down menu, Tranplan, has two options for the user. The first option, Model Run, allows the user to take advantage of the interface’s programming to create all necessary files for the Tranplan modeling process. All file loading has been automated, providing a streamlined modeling process. The second option, Rejoin a Model Run, allows the user to return to a previously completed process in the Model Run, and repeat the remainder of the modeling process. An example of the Tranplan pull-down menu options can be found below in Figure 5-1.

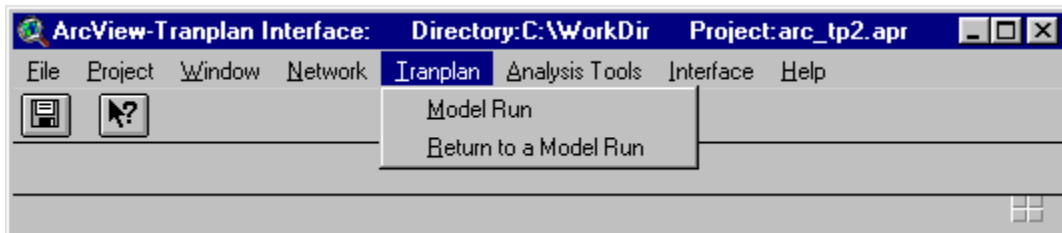


Figure 5-1

5.1 Tranplan Model Run – “Model Run”

Description: The “Model Run” options allows the user to easily execute Tranplan, and display the output in ArcView. This is accomplished through the use of six steps.

1. Export ArcView Tables and Build Highway Network Control File
2. Create an Optional Tranplan Control File
3. Execute Tranplan
4. Run Netcard.exe
5. Create ArcView Text Network
6. Create ArcView Graphical network.

These six steps can also be carried out through the use of the “Join a Model Run” pull-down menu option. Selecting “Model Run” begins the modeling process with step one and continues through step six. By selecting “Join a Model Run” the user can pick a step that needs to be repeated. Any one of the six steps of the modeling process can be selected, with the modeling process being continued from there. The procedures for completing the entire “Model Run” are identical to the steps required for completing all the “Join a Model Run” steps, therefore see the section of Tranplan Model Run – “Join a Model Run” for more details.

Quick Instructions:

1. Select the Tranplan-“Model Run” pull-down menu option.
2. Enter into Arcnet the number of TAZ’s and whether the model includes a turn prohibitor file. If the model does include a turn prohibitor, select yes, then enter the name of the turn prohibitor file in the turn prohibitor file name input form.
3. Select Yes if the interface is to write the Tranplan control files. Select No to use an existing Tranplan control file, then go to step six.
4. Select the Default Tranplan control file option, and press OK.
5. Enter the required input into the Default Module Builder.
6. Select Yes if the interface is to run Tranplan. If No, go to step nine.

7. Select the Default Tranplan control file, unless a user-designed Tranplan control file exists and is preferred.
8. After Tranplan is completed the model run, type EXIT in the DOS window, or simply close the DOS window.
9. Input the required file names and options into Netcard as shown in Figure 5-15, then close the DOS window.
10. Enter the name of the Netcard output file into the Arc_Load User Input form and press Continue. A *ld_links.shp* and *centroid.shp* file will be created.

5.2 Tranplan Model Run – “Join a Model Run”

Description: The “Join a Model Run” option of the Model pull-down menu allows the user to return to one of the six modeling steps as listed in the Tranplan Model Run – “Model Run” section of this manual. In the event that one of the six steps in the modeling process was unsuccessful, the user can select the “Join a Model Run” option. This option displays a list of options, see Figure 5-2, to specify the step that requires repeating.

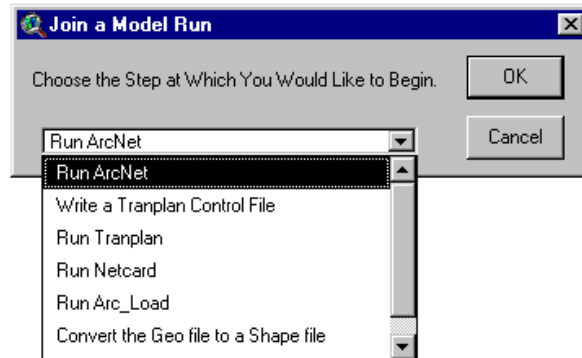


Figure 5-2

5.2.1 Export ArcView Tables and Build Highway Network Control File

Description: Once a network has been built in ArcView, including both the tabular data in attribute tables (see Figures 4-16 & 17), and the visual data in a view named “Network” (see Figure 4-18), the Tranplan model run can begin. To provide text files containing the nodes and links data for upcoming applications, the attribute tables are exported (see Figures 5-3 & 4). Next, the Tranplan control file for operating the Build Highway Network module is written by Arcnet.

Quick Instructions: Begin on step two of quick instructions in the Tranplan Model Run – “Model Run” section.

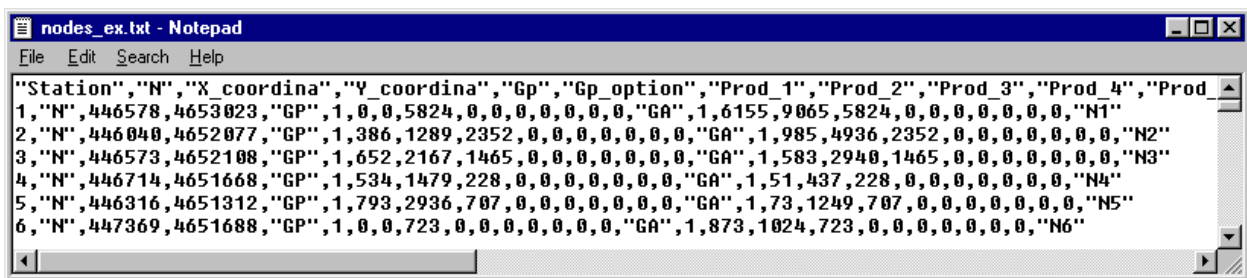


Figure 5-3 Nodes_ex.txt Example

** Please note that the header shown in incomplete. Due to space, then end of the header was truncated. The complete header can be found below.

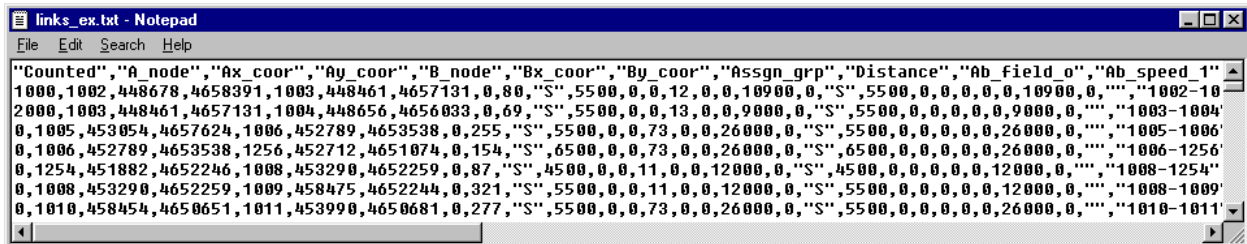


Figure 5-4 Links_ex.txt Example

** Please note that the header shown is incomplete. Due to space, the end of the header was truncated. The complete header can be found below.

Input (User): Arcnet's input window (see Figure 5-5) calls for both the number of TAZ's and for the existence of a turn prohibitor file. The TAZ input box (**Please input the number of TAZ's that are a part of this model**) has listed as the default the value from TAZ.txt (Figure 4-13). The turn prohibitor input box (**Does this model include a turn prohibitor**) lists the choices of No or Yes. The default is No, so in the event of no input, the program assumes that no turn prohibitor file exists. By selecting Yes, then hitting Continue, a second input window will appear prompting the user for the name of the turn prohibitor file name. A browse button is provided to allow navigation to the required file. Once the turn prohibitor file (Figure 5-6) is located, pressing Continue executes the program, or Cancel returns the original Arcnet input window.

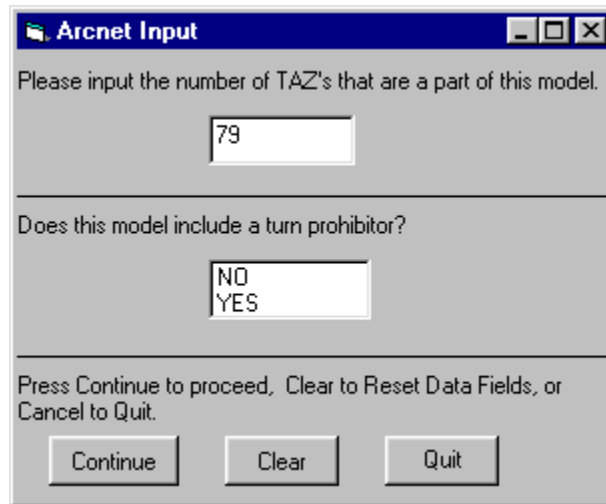


Figure 5-5 Arcnet Input Window

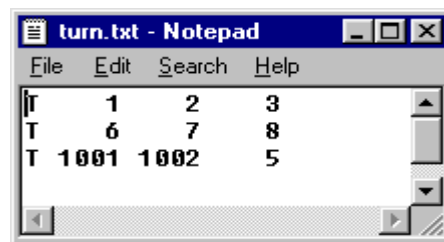


Figure 5-6 Turn Prohibitor File, *turn.txt* Example

See the Tranplan user's manual, Networks section, page 1-10 for more details.

Input (Default): Arcnet requires that several files exist that are not input by the user. Without the required default files, the program will not operate. The first default file is the directory tree file, *dirtree.txt*, described in the Tranplan Text Network – “Create a Tranplan Network” section of this manual (Figure 4-10). This file contains the name of the working directory. This directory contains all the input, and will receive all the output. The next required file is *taz.txt*, which is described in Tranplan Text Network – “Create a Tranplan Network” also (Figure 4-13). It contains the user's previously entered value for the number of TAZ's in the scenario's network. Exported files from ArcView, called *nodes_ex.txt* (Figure 5-3) and *links_ex.txt* (Figure 5-4) are the two final default inputs for running Arcnet.

Output: Arcnet produces a text file, *net-in.txt*, which is used as a control file when running Tranplan. This control file is created exclusively for the project scenario that is being worked on. The module that Tranplan will execute when *net-in.txt* is run is the Build Highway Network module. The output file that Tranplan will create when executing *net-in.txt* is *net.bin*.

5.2.2 Write a Tranplan Control File

Description: The interface provides the user with the option to use a default Tranplan control file that is written specifically for the current scenario. By selecting Yes when prompted to use a Visual Basic control file (Figure 5-7), the Default Module Builder program is utilized. Default Module Builder (Figure 5-8) writes a text file that is used as the

control file for Tranplan. This control file ensures the user that all¹ required output files from Tranplan will be created when performing a model run. Selecting No allows the use of an existing Tranplan control by the interface.

Quick Instructions: Begin on step three of quick instructions in the Tranplan Model Run – “*Model Run*” section.

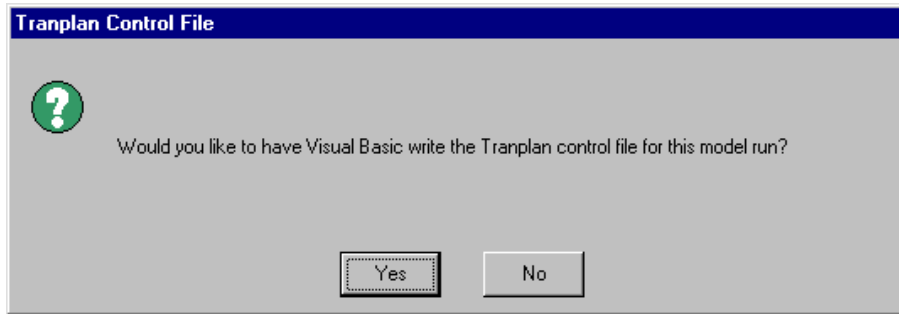


Figure 5-7

Input (User): Default Module Builder (see Figure 5-8) requires the user input of two file names and three variables. The first input box (**Input the Turn Penalty/Prohibitor File, or Hit Continue if No Turn Restrictions Exist**) requires the turn penalty/prohibitor file (see Figure 5-9 for an example file). Hitting Continue or not selecting a file indicates that no turn penalties or turn prohibitors exist in the scenario’s model. The next input box (**Input the Total Number of TAZs**) will contain the default value found in *TAZ.txt* (Figure 4-13) for the scenario. The following two boxes (**Input the First External Zone Number** and **Input the Last External Zone Number**) prompt the user to indicate the range of numbers that contain the external nodes of the scenario’s network. The input box (**Input the Name of the Trip Survey Data File**) requires the user to input the external nodes trip data file for the scenario’s model. The default file given is *ext.dat* (see Figure 5-10). The next input box (**Input the Name of the Network Friction File**) requires the network friction data (see Figure 5-11). The final input box (**Input the Name of the Production/Attraction File**) prompts the user to input the name of the Network Data User Input form’s newly created production/attraction file, *newgm.pa*.

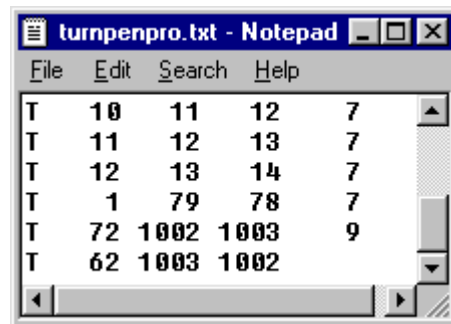
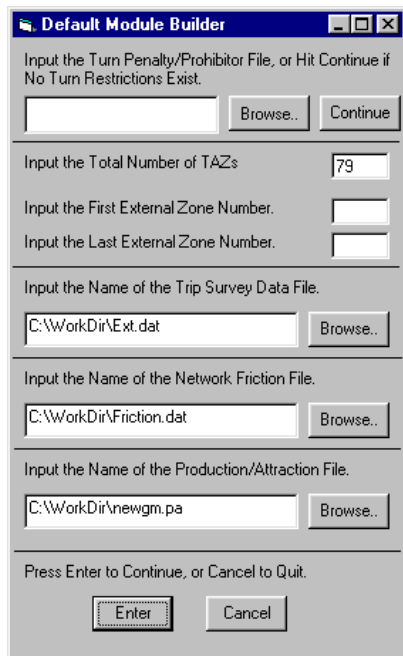


Figure 5-9 *Turnpenpro.txt* Example
For more details, see the Tranplan user’s manual, Loading section, page 4-12.

Figure 5-8 Default Module Builder Input Window

File	Edit	Search	Help
72	73	1	440
72	74	1	0
72	75	1	32
72	76	1	4
72	77	1	1
72	78	1	7

Figure 5-10 *Ext.dat* Example

This data must be formatted according to the Simple format described in the Tranplan User's Manual, Matrix Utilities section, page 6-4.

File	Edit	Search	Help		
GF	3	1	19291	25562	37607
GF	4	1	16963	16072	23203
GF	5	1	14936	10979	15601
GF	6	1	13161	7904	11075
GF	7	1	11605	5900	8163
GF	8	1	10236	4522	6184

Figure 5-11 *Friction.dat* Example

For more details, see the Tranplan User's Manual, Models section, page 1-8

Input (Default): The Default Module Builder program uses the same default files as the previously documented programs. These include the *dirtree.txt* file and *taz.txt* file (see Figures 4-10 and 4-13 respectively); along with the *nodes_ex.txt* file (see Figure 5-3). Also required in the output of the Arcnet control file builder, *net-in.txt*.

Output: Only one file is produce from the Default Module Builder, and similar to Arcnet, this is a text file that is used as a control file for running Tranplan. Called *default.in* (see Figure 5-12 for a portion of *default.in*), this control file will create the necessary data files for running the analysis tools associated with the Interface. The modules that Default Module Builder uses as part of its control file include: Highway Selected Summation, Build Intrazonal Impedances, Matrix Update, Gravity Model, Build Trip Table, Matrix Manipulate, Matrix Transpose, Equilibrium Highway Load and Report Matrix.

```

default.in - Notepad
File Edit Search Help
013320133300000S2526000001110000012000000640S252600000100
$SEND TP FUNCTION
$HIGHWAY SELECTED SUMMATION
$FILES
  INPUT FILE = HWYNET, USER ID = $C:\WorkDir\NET.BIN$
  OUTPUT FILE = HWYSKIM, USER ID = $SKIM90.SKI$
$DATA
  TABLE = TIME 1
$SEND TP FUNCTION
$BUILD INTRAZONAL IMPEDANCES
$FILES
  INPUT FILE = IZIN, USER ID = $SKIM90.SKI$
  OUTPUT FILE = IZOUT, USER ID = $SKIMG90.SKI$
$OPTION
  PRINT DETAIL
$PARAMETERS
  NUMBER OF ADJACENT ZONES = 2
$SEND TP FUNCTION
$MATRIX UPDATE
$FILES
  INPUT FILE = UPDIN, USER ID = $SKIMG90.SKI$
  OUTPUT FILE = UPDOUT, USER ID = $SKIMG90.SK2$
$DATA
  TIME1, 72 , 72 , R 99999
  TIME1, 73 , 73 , R 99999
  TIME1, 74 , 74 , R 99999
  TIME1, 75 , 75 , R 99999
  TIME1, 76 , 76 , R 99999
  TIME1, 77 , 77 , R 99999

```

Figure 5-12 Sample of *Default.in*

5.2.3 Execute Tranplan

Description: The interface gives the user the option to run Tranplan from ArcView. Selecting Yes to **Would you like the interface to run Tranplan?** (Figure 5-13) prompts the user to select which control file for Tranplan to execute. Selecting No sends the interface to step four (Run Netcard.exe). A control file is specified by selecting either the default control file, or an existing control file (Figure 5-15). Using a pre-existing control file prompts the formatting of the control file using the Format window (Figure 5-16). Then the interface copies the control file into the Tranplan directory, and writes a DOS batch file to execute Tranplan. The copied control file is renamed to the default value of *trnpln.in*, overwriting any previous Tranplan model runs. The batch file is stored in the scenario's working directory, and is named *tprun.bat* (Figure 5-14). *tprun.bat* first navigates to the Tranplan directory, then executes *trnplnxt.exe*. This Tranplan program creates a second batch file, which is stored in the Tranplan directory. This second batch file, *trnplnx.bat*, gives directions on running the control file, *trnpln.in*. The last command in *tprun.bat* executes the newly created batch file *trnplnx.bat*, which caused Tranplan to execute the model run. Once Tranplan has completed the model run, the output file *trnpln.out* is copied to the scenario's working directory and renamed to the original input file's filename, but with *.out* as a file extension. **Note: The Tranplan DOS window must be closed manually.**

Quick Instructions: Begin on step six of quick instructions in the Tranplan Model Run – “*Model Run*” section.

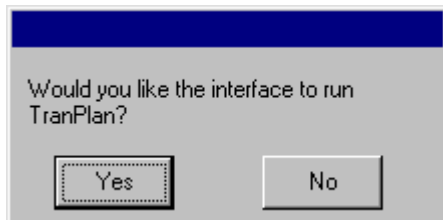


Figure 5-13

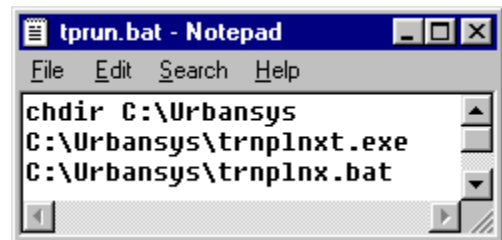


Figure 5-14 *tprun.bat*

Input (User): The first required input from the user is whether or not to run Tranplan through the interface. If the user chooses to allow the interface to operate Tranplan, then the second input is to select which control file(s) to be used with Tranplan. The user may either choose to use the default control file created in the Write a Tranplan Control File section of this chapter, or choose to use previously written control file(s) for the scenario. The filename and location of previously written control files must then be specified if the default control file is not selected.

Output: A completed Tranplan model run results in an output file called *trnpln.out*, which is copied to the working directory and renamed *default.out*. Also created as part of the model run are the network file containing the loaded traffic volumes, called *out.bin*, and the origin-destination matrix file, *tot90x.trp*.

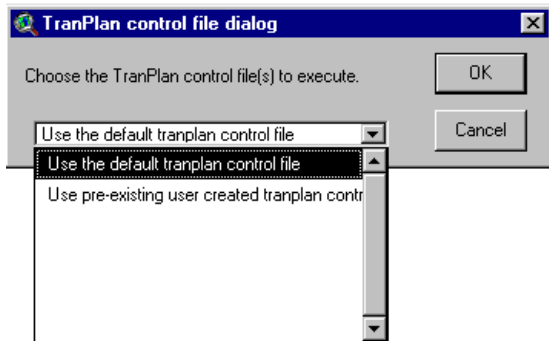


Figure 5-15 Selecting a Control File

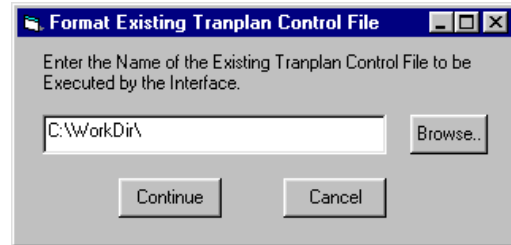


Figure 5-16 Specifying a Pre-existing Control File

5.2.4 Run Netcard

Description: By selecting the “Run Netcard” option, the interface calls *Netcard.exe*. Netcard is a Tranplan program that converts the binary files used by Tranplan to text files in Tranplan format. Figure 5-17 shows Netcard.exe, including defaults to the required inputs.

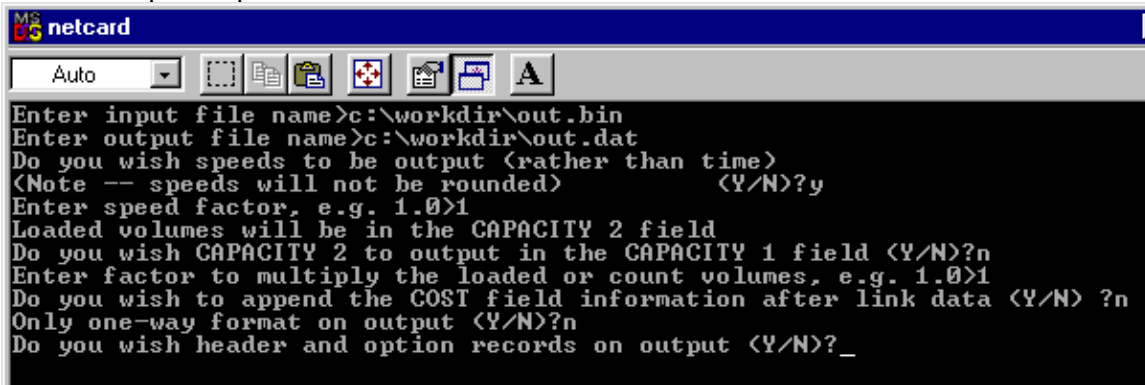


Figure 5-17 Netcard Example

Quick Instructions: Begin on step nine of quick instructions in the Tranplan Model Run – “Model Run” section.

Input (User): The critical input statement for Netcard.exe is **Enter input file name**. This file is the binary file created during the Tranplan model run. During this stage of the interface, the required binary file contains the loaded traffic volumes, along with either the speeds or times, on each network link. The default values for the remaining input statements are shown in Figure 5-17. **Note: Enter the Entire file name, including the path.**

Output: Netcard.exe produces a text file containing the loaded network. This file is Tranplan formatted, and contains nodes, turn prohibitors, and the loaded links for the scenario’s network. An example of the Netcard output is shown in Figure 5-19.

5.2.5 Create ArcView Text Network

Description: The “*Create ArcView Text Network*” option converts Tranplan formatted Netcard output into ArcView shapefiles. The interface uses the Arc_Load form (Figure 5-18) to make the data conversion. Arc_Load creates an updated geo file to display the Tranplan output in the interface. The output from Netcard is joined with the original *links.geo* file to create a loaded links file called *ld_links.geo*. This new file contains both the actual counted volumes and the applied Tranplan volumes for each link, along with a percent difference column for analysis purposes.

Quick Instructions: Begin on step ten of quick instructions in the Tranplan Model Run – “*Model Run*” section.

Input (User): The user is prompted to input the name of the output file from Netcard (**Input the name of the ASCII text file from the Tranplan Run**). The default name is *out.dat*, however, the file name must be identical to the output name specified in Netcard. The input window can be found in Figure 5-18. A sample of *out.dat* is pictured in Figure 5-19.

Input (Default): Arc_Load requires that the directory tree file (see Figure 4-10) and the *links.geo* file (see Figure 4-12) are present in the scenario’s working directory.

Output: Arc_Load creates a new geo file containing the loaded volumes for the scenario’s network. All pertinent information that Tranplan produces about scenario’s network links is written into the new geo file. This file is called *ld_links.geo*, and is used to create a shape file in ArcView. See Figure 5-20 for a *ld_links.geo* file example.

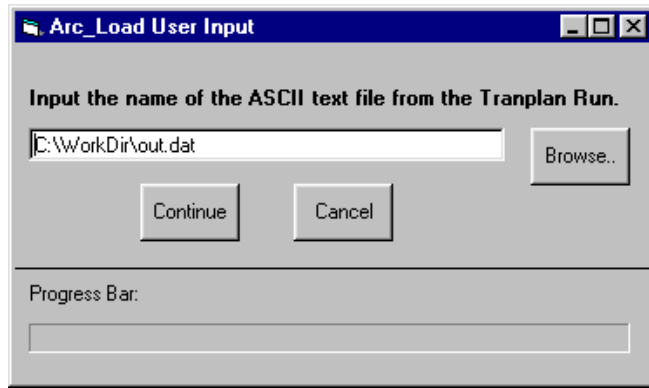


Figure 5-18 Arc_Load Input Window

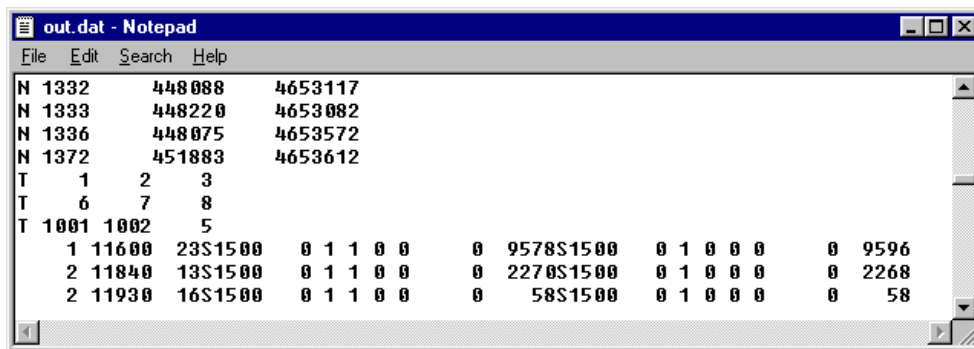


Figure 5-19 out.dat

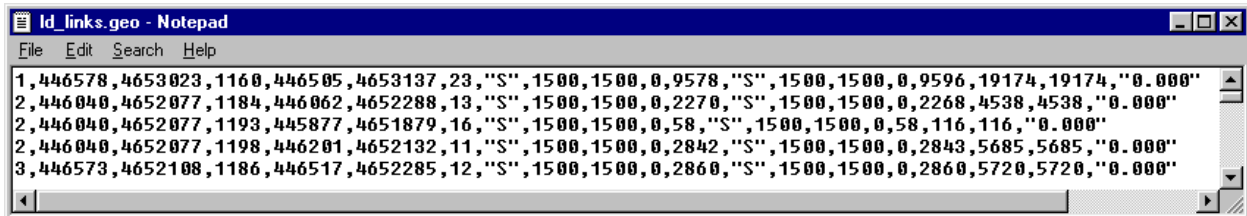


Figure 5-20 Ld_links.geo

At this point, *ld_links.geo* is converted into *ld_links.shp* by ArcView, and then displayed in the Network View Screen. Finally, the interface creates a shapefile containing the centroids in the network, named *centroid.shp*. This is the last step in loading the scenario's network. All coordinates, ground counts, and Tranplan output are accessible by browsing through the *ld_links.shp* file and its attribute table. Figure 5-21 shows the Network View Screen containing the *ld_links.shp* file, along with the attribute table. Analysis of the scenario's network can now be done through the use of the built-in analysis tools.

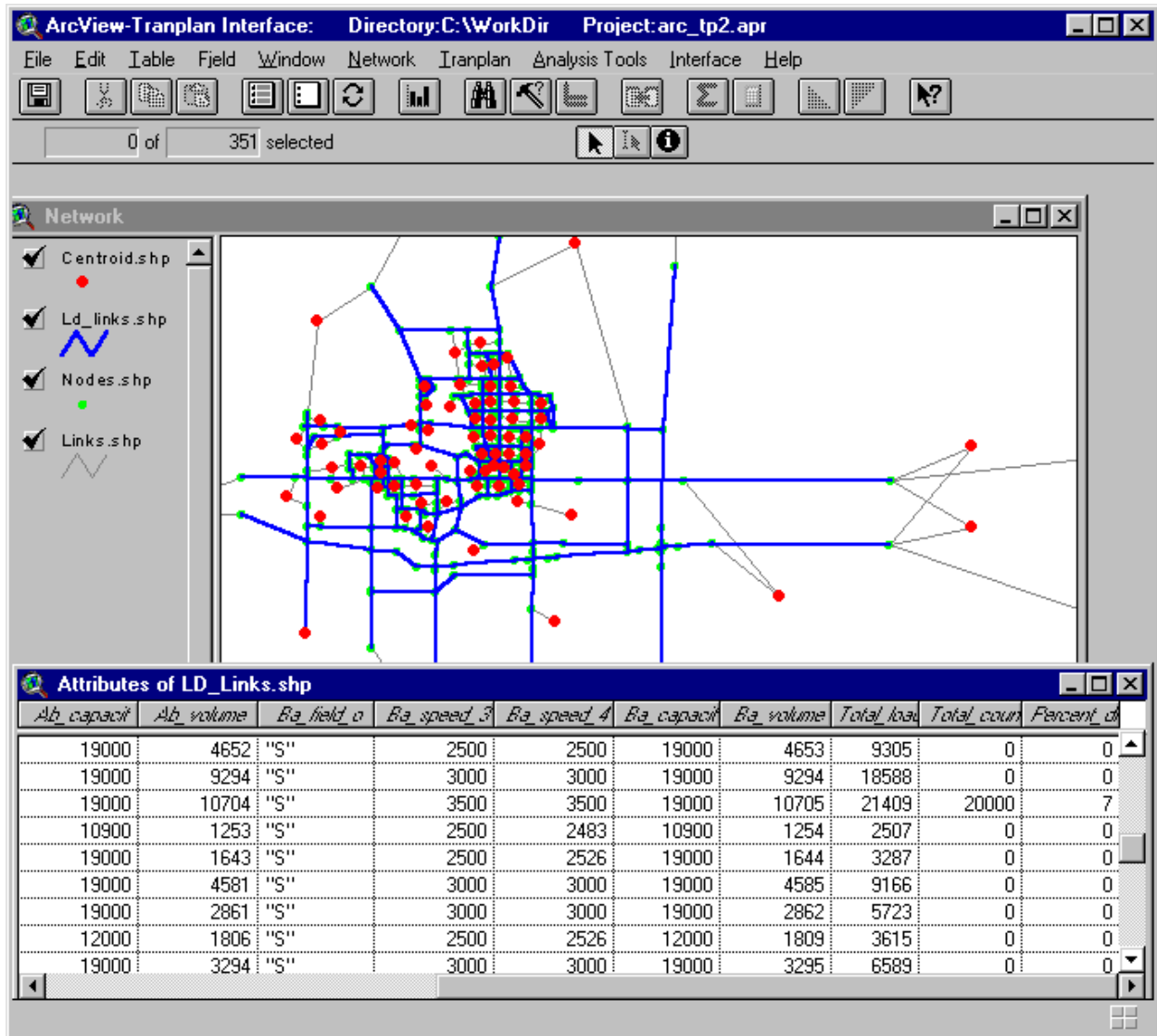


Figure 5-21 Interface with the Loaded Network

6. Using the Interface: Analyzing Model Output –“Analysis Tools”

The Analysis Tools pull-down menu provides four tools that act on the loaded network. These tools assist the user in quickly finding information pertaining to the scenario’s model. An example of these pull-down options can be found in Figure 6-1.

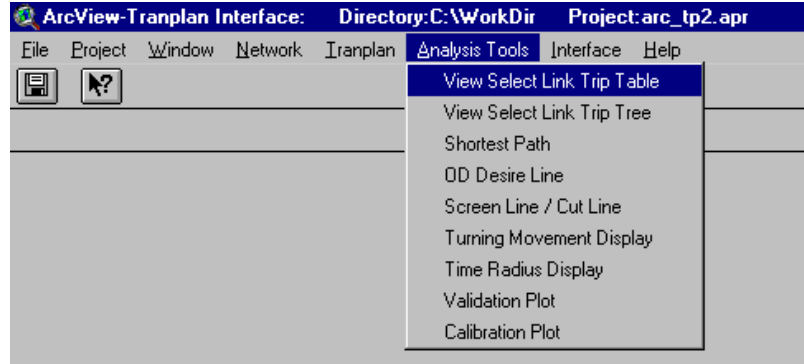


Figure 6-1 Analysis Tools Pull-down Menu

6.1 Select Link Analysis –“View Select Link Trip Table”

Description: The Select Link analysis tools allow the user to display the output from a Tranplan select link analysis. The Tranplan analysis procedure has not been automated in this interface version, requiring the use of the Tranplan control file shown in Table 6-1. Once the select link data has been acquired from Tranplan, the interface is able to display the information in several different ways. Figure 6-3 prompts the user to select whether the origins or destinations of the trips traveling on the selected link are to be displayed. Once both the origins and destinations are displayed, the ratio between the origins and destinations at each centroid can also be displayed.

Table 6-1 Select Link Tranplan Control File

\$LOAD HIGHWAY SELECTED LINKS	\$FILES
\$FILES	INPUT FILE = HWYTRIP, USER ID = \$TOT90X.TRP\$
INPUT FILE = HWYNET, USER ID = \$NET.BIN\$	INPUT FILE = SELHIST, USER ID = \$ONE.BIN\$
INPUT FILE = HWYTRIP, USER ID = \$TOT90X.TRP\$	INPUT FILE = SELHST2, USER ID = \$TWO.BIN\$
OUTPUT FILE = LODHIST, USER ID = \$JOE.BIN\$	INPUT FILE = SELHST3, USER ID = \$THREE.BIN\$
OUTPUT FILE = SELHIST, USER ID = \$ONE.BIN\$	INPUT FILE = SELHST4, USER ID = \$FOUR.BIN\$
OUTPUT FILE = SELHST2, USER ID = \$TWO.BIN\$	OUTPUT FILE = SELVOL, USER ID = \$SSL-TRIAL.BIN\$
OUTPUT FILE = SELHST3, USER ID = \$THREE.BIN\$	\$OPTIONS
OUTPUT FILE = SELHST4, USER ID = \$FOUR.BIN\$	PRINT TRIP ENDS
\$OPTIONS	OR LINKS
DAMPING	\$PARAMETERS
ADJUST 100	SELECTED LINKS = 1253-1246,1217-1213,1187-1186
\$PARAMETERS	\$SEND TP FUNCTION
IMPEDANCE = TIME1	\$EQUILIBRIUM HIGHWAY LOAD
LOAD SELECTED LINKS = 1253-1246,1217-1213,1187-1186	\$FILES
TWO WAY SELECTED LINKS = 1253-1246,1217-1213,1187-1186	INPUT FILE = HWYNET, USER ID = \$NET.BIN\$
LOAD PERCENTAGES = 40, 30, 20, 10	INPUT FILE = HWYTRIP, USER ID = \$SSL-TRIAL.BIN\$
TRIP LENGTHS = 200 - 1500	OUTPUT FILE = LODHIST, USER ID = \$SLOut.BIN\$
DISTANCE FACTOR = 0.0	\$OPTIONS
TIME FACTOR = 1.0	SAVE ALL TURNS
\$SEND TP FUNCTION	\$PARAMETERS
\$BUILD SELECTED LINK TRIP TABLE	EQUILIBRIUM ITERATIONS = 4
	\$SEND TP FUNCTION

Quick Instructions:

1. Run Tranplan, using the control file shown in Table 6-1.
2. Select the Analysis Tools-“Select Link Trip Table” pull-down menu option. Press Yes if the Tranplan output is stored in the working directory. If the Tranplan output is not stored in the working directory, return to the working directory and paste in the output.
3. Enter the name of the Tranplan output file into the Format Select Link Data Files form, Figure 6-2.
4. Choose the desired display option in the View Select Link Analysis Results form, Figure 6-3. **Note:** The View Ratios of Origins versus Destinations option can be displayed only after both the View Volumes for Origin Nodes and View Volumes for Destination Nodes have been displayed.

Input (User): The user is required to provide the name of the output file from the Tranplan select link analysis. Figure 6-2 shows the Format Select Link Data Files input form, which prompts the user for the select link data file. An example of the data file, *SL-trial1.dat*, is shown in Figure 6-4.

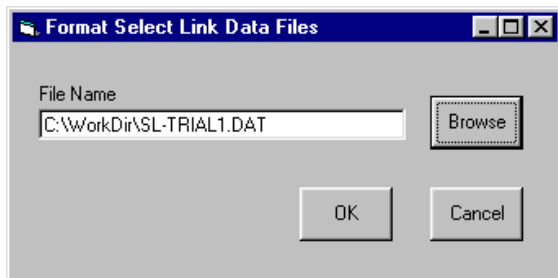


Figure 6-2 Format Select Link Data Files

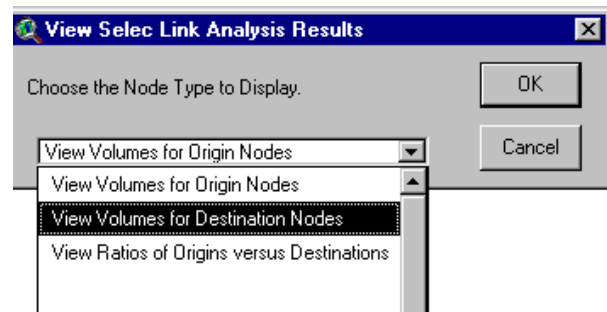
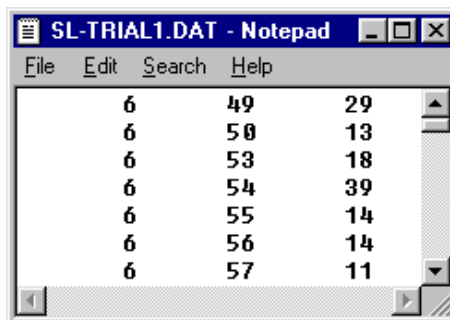


Figure 6-3 View Select Link Analysis Display Option List



6	49	29
6	50	13
6	53	18
6	54	39
6	55	14
6	56	14
6	57	11

Figure 6-4 *SL-trial1.dat* Example

Input (Default): The Format Select Link Data Files form requires that the dirtree.txt file (Figure 4-10) exist. **Note:** To display the ratio of origins versus destinations, both the origin and destinations must already be displayed.

Output: Shapefiles are created in the Network view as output of the “View Select Link Trip Table”. By selecting the “View Volumes for Origin Nodes” display option, an *origin.shp* shapefile is created showing the number of trips originating in each centroid. The “View Volumes for Destination Nodes” display option creates the *dest.shp* shapefile. Selecting the “View Ratios of Origins versus Destinations” display option creates *slratio.shp* (Figure 6-5). This shapefile sizes the centroids based on the total number of trips that originate or terminate at the centroid and travel through the selected link. The centroid is colored according to the ratio of origins versus destinations.

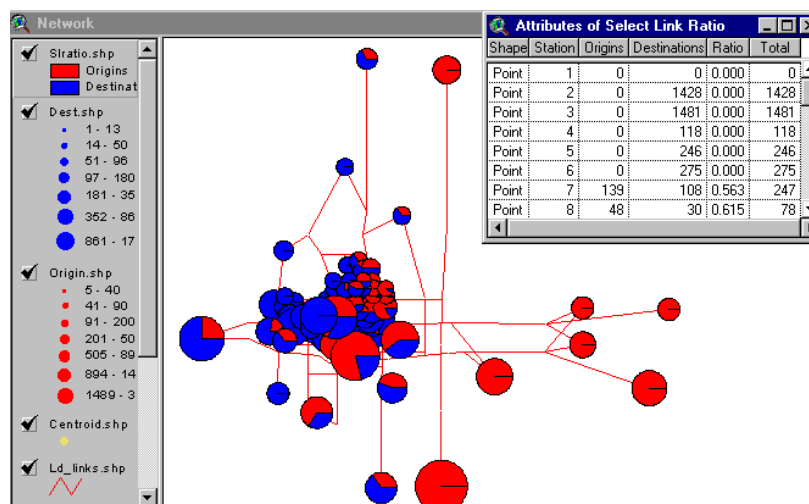


Figure 6-5 Network View with a *slratio.shp* example

6.2 Select Link – “View Select Link Trip Tree”

Description: The select link analysis tool, “View Select Link Trip Tree”, uses Tranplan select link analysis output to produce a visual display of the links loaded with trips traveling on the selected link. The procedure for obtaining the select link Tranplan control file is discussed in the Select Link - “View Select Link Trip Table”. To create the data file containing the select link output, the user can simply use the Tranplan Model Run – “Join a Model Run” section of this manual, starting with Run Tranplan. Use the newly created control file rather than the default control file. When executing Netcard, use the newly created binary file, *slout.bin* for the input file name. The default output name is *slout.dat*. All other inputs can be answered as seen in Figure 5-15. The user may now use the “View Select Link Tree” tool.

Quick Instructions:

1. Run Tranplan, using the control file shown in Table 6-1.
2. Select the Analysis Tools-“Select Link Trip Tree” pull-down menu option. Press Yes if the Tranplan output is stored in the working directory. If the Tranplan output is not stored in the working directory, return to the working directory and paste in the output.
3. Press Yes if the output from the select link Tranplan run has been run through Netcard. If the select link Tranplan output has not been ran through Netcard, press No and refer to Figure 5-15 for assistance.
4. Enter the name of the Netcard output from step 3 into Arc_Load.
5. Set the parameters in the legend editor, and press Apply.

Input (User): Before the user can begin, the data must be retrieved from Tranplan. The outline for this procedure is discussed in the description paragraph of this section. Once a data file has been produced from Netcard containing the select link trips assigned to the network, the “View Select Link Trip Tree” tool can be used. The first screen verifies that Tranplan has been executed on a select link control file with the output stored in the scenario’s working directory. The second screen prompts the user if Netcard has been run on the Tranplan select link output. If Netcard has not been run on the output, refer to Figure 5-15 for Netcard instructions. Next, the Arc_Load form appears, prompting the name of the output file from Netcard. **Note:** the default value in Arc_Load is the model run output file, *out.dat*, not the select link output file, *slout.dat*. Finally, ArcView’s legend editor screen appears (Figure 6-6), prompting the user to verify the format of the shapefile.

Input (Default): Arc_Load’s required default inputs can be found in the **Tranplan Model Run – “Join a Model Run”** section of this manual.

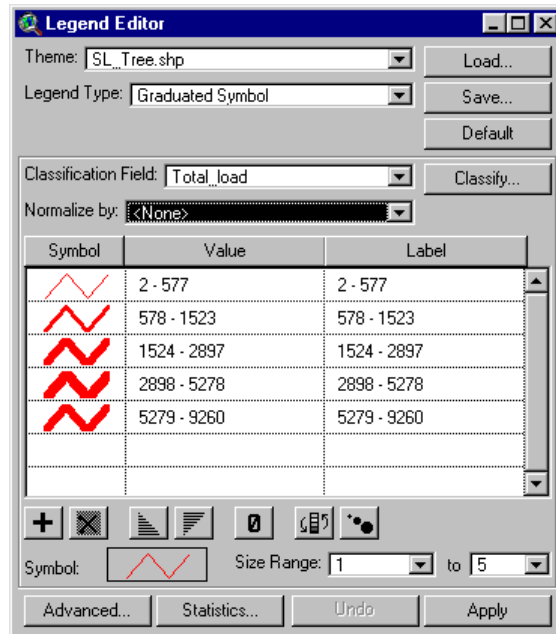


Figure 6-6 ArcView’s Legend Editor Screen

Output: The final product from the “View Select Link Tree” is the *SL_Tree.shp* shapefile. This file buffers the links in the network according to the number of trips that travel on both the buffered link and selected link. An example of *SL_Tree.shp* can be seen in Figure 6-7.

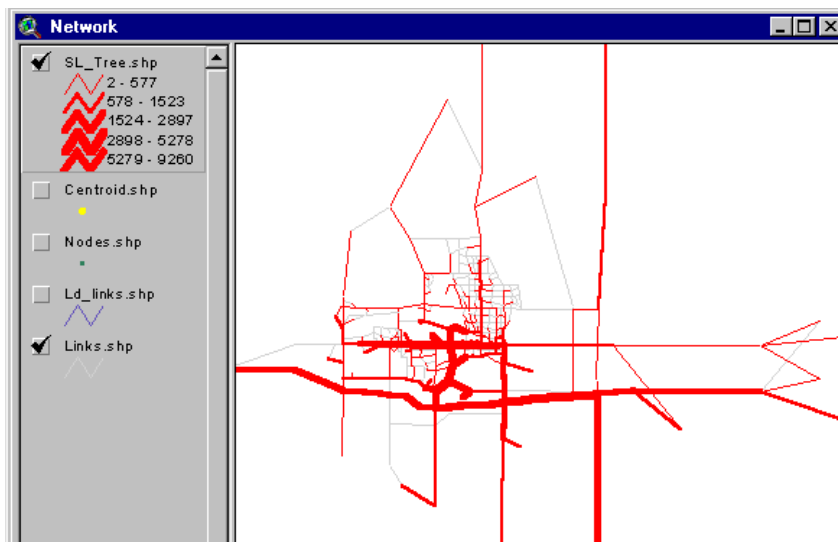


Figure 6-7 *SL_Tree.shp* Example

6.3 Analysis Tools – “Shortest Path”

Description: The Shortest Path analysis tool allows the user to identify the shortest path between any two nodes in the scenario’s network. By selecting the two nodes with the use of the mouse, a shapefile showing all links that make up the shortest path between the nodes will be displayed.

Quick Instructions:

1. Select the Analysis Tools –“Shortest Path” pull-down menu option.
2. Select two centroids by using the Select Feature tool in ArcView while pressing the shift key, then press the Shortest Path Continue Button, as shown in Figure 6-8.
3. Verify that the highway network file is correct.
4. Choose an impedance
5. Click **OK**
6. Close the Tranplan DOS window.
7. Press OK to the Continue screen, then enter the desired name of the shapefile to be created.
8. To add a desire line, see the Analysis Tools – “O/D Desire Line” section.

ArcView Input: By selecting the Shortest Path option from the Analysis Tools pull-down menu, the interface will prompt the user to select two nodes from which the shortest path will be built between. To aid the user in properly executing this task, the *nodes.shp* layer is made visible, and the select features tool from the toolbar menu is selected. By using the mouse, and holding down the Shift key, two nodes can be selected. Figure 6-8 illustrates how the ArcView appears

while the user is selecting nodes.

Notice in Figure 6- 8 that a new tool button, the Shortest Path Continue Button, has been created. Once the two nodes have been selected, pressing the continue button will display the Shortest Path Module Builder window (see Figure 6-8.A). In this window, first check to make sure that the highway network file is correct. The highway network file is the links and nodes network created by the Build Highway Network module. Use the list box to choose the impedance used to determine the shortest path and then click **OK**.

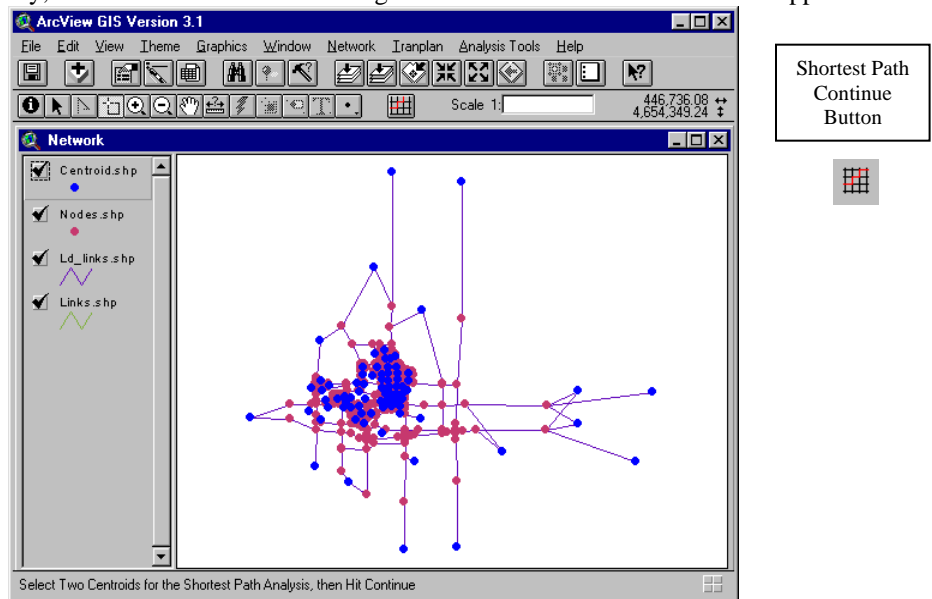


Figure 6-8 ArcView Prompting Two Nodes for Shortest Path

Tranplan Input: After the Shortest Path Module Builder window, the interface creates a Tranplan control file named *smodule.in*, along with a batch file called *sprun.bat*. *Sprun.bat* as seen in Figure 6-9, gives the instructions to run Tranplan similar to *tprun.bat* as discussed in the **Tranplan Model Run – “Join a Model Run”** section. The output from running *smodule.in* through Tranplan is the *S-path.dat* file, which contains the nodes of each link that the shortest path goes through, along with the cumulative time on each of the links. Figure 6-10 shows an example of *S-path.dat*. *S-path.dat* is then converted into *s-path.geo*, a file that is required to create a shapefile. *S-path.geo* is shown in Figure 6-11.

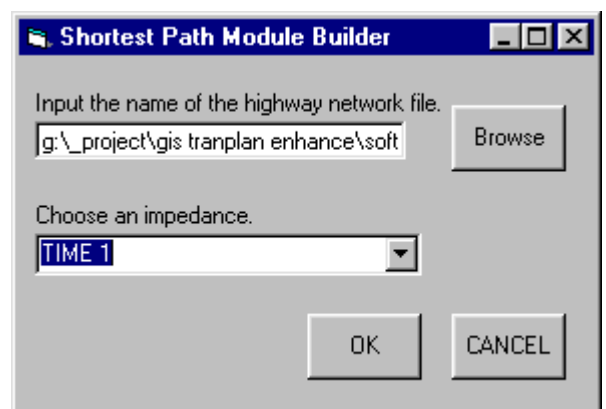


Figure 6-8.A

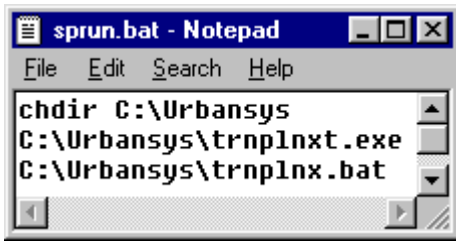


Figure 6-9 *sprun.bat*

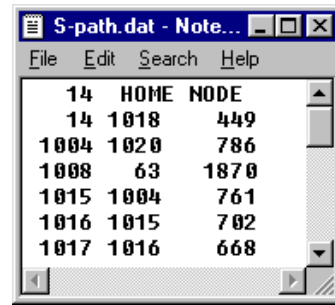


Figure 6-10 *S-Path.dat* Example

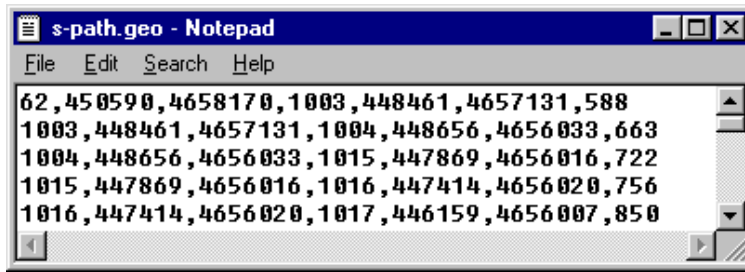


Figure 6-11 *S-Path.geo* Example

Input (User): As the interface creates the shapefile of the shortest path, the user must select the name of this shapefile. The default value of *s-path.shp* is given, however, if multiple instances of the Shortest Path tool are executed in a given scenario, then selecting the default name will overwrite any previous data. Figure 6-12 shows the Shortest Path name input window.

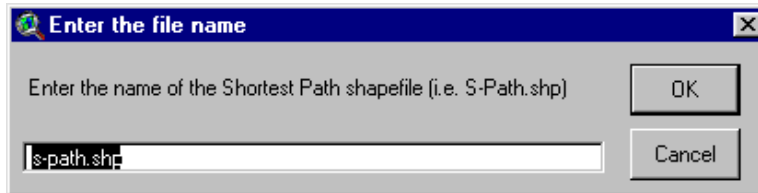


Figure 6-12 Naming the Shortest Path shapefile

Input (Default): The Shortest Path Analysis Tool requires three existing files, *dirtree.txt* (Figure 4-10), *taz.txt* (Figure 4-13), and *nodes_ex.txt* (Figure 5-3), along with the *ld_links.shp* and *centroid.shp* shapefiles in the Network view.

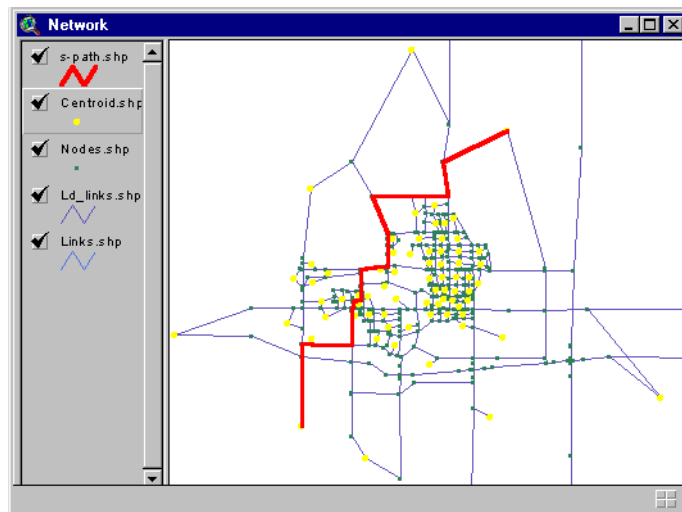


Figure 6-13 Shortest Path Shapefile Example

Output: The shapefile that is created by the Shortest Path Analysis Tool is the important output file. An example of this file is shown in Figure 6-13.

6.4 Analysis Tools – “O/D Desire Line”

Description: The Desire Line program allows the user to designate an origin and destination zone from which a shapefile will be constructed. This file will create a weighted line, with the weight of the line varying proportionately with the volume between the origin and destination.

Quick Instructions:

1. Select the Analysis Tools – “O/D Desire Line” pull-down menu option.
2. Select two centroids by using the Select Feature tool in ArcView while pressing the shift key, then press the Desire Line Continue Button, as shown in Figure 6-14.
3. Press Yes if the trip matrix has been converted to text format using TPCard. If the trip matrix has not been converted to text format, press no and refer to Figure 6-16 for assistance with TPCard.
4. Press Yes to Continue, then verify that TPCard has converted the trip matrix to text format.
5. Enter the output file from TPCard, then verify the centroid numbers shown are correct.
6. To clear all previous desire lines in the scenario, press Clear Records. To clear the centroids shown from the Desire Line Input form, press Clear Screen. To continue, press Add Record. To exit, press Quit.
7. Press Yes to continue.

ArcView Input: By selecting the “O/D Desire Line” option from the Analysis Tools pull-down menu, the interface will prompt the user to select the two centroids for the desire line. To aid the user in properly executing this task, the *nodes.shp* layer is made visible, and the select features tool from the toolbar menu is selected. By using the mouse, and holding down the Shift key, two centroids can be selected. Figure 6-14 shows how the ArcView appears while the user is selecting centroids.

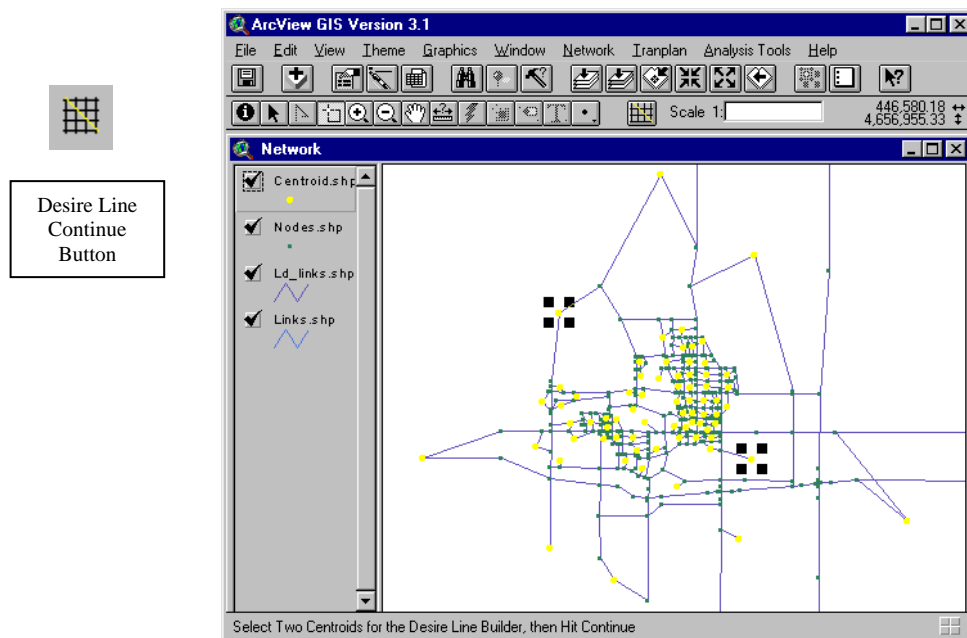


Figure 6-14 ArcView Prompting Two Centroids for Desire Line

Notice in Figure 6-14 that a new tool button, the desire line builder continue, has been created in the toolbar. Once the user has selected the two centroids for the desire line, the continue button will initiate the remainder of the desire line program. Next, the interface will prompt the user if the origin/destination table from Tranplan has been converted to text through the use of the Tranplan program *TPCARD.EXE* or *TPCARD1.EXE* (Figure 6-15). If the data has not been converted (meaning the data remains in binary form), the interface will open *TPCARD1.EXE* to proceed with the conversion.

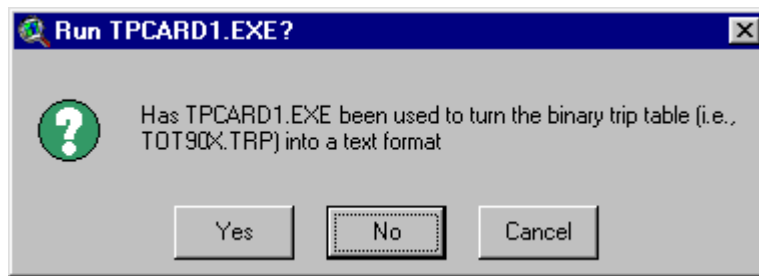


Figure 6-15 Prompt for Need to Execute *TPCARD1.EXE*

Selecting Yes will instruct the interface to skip the data conversion and proceed to the desire line module builder, Figure 6-17. This can only be done if the binary data file containing the origin/destination data for the current scenario has previously been converted to text format.

Selecting No will send the interface to Tranplan’s binary file conversion program, *TPCARD1.EXE* (Figure 6-16). The input file is the output of a matrix update that averages the trips from TAZ to TAZ. If the user used the default control file, then the input file name is *tot90x.trp*. The output file name is arbitrary; however, the file name *odfile.dat* is used as the default name for the input file in the desire line module builder, Figure 6-18.

If unsure as to whether the origin/destination table data has indeed been converted to text format, it is advisable to rerun TPCARD1 on the binary data. This binary file will exist whether the binary data has been converted or not. Rerunning TPCARD1 will simply ensure that the conversion has taken place, however, rerunning TPCARD1 will not overwrite any data in the scenario’s output file. To create a new converted file, either delete *odfile.dat* from the scenario’s directory before running TPCARD1, or create a new filename for the output. If a new filename is created, be sure to verify this new filename is chosen in the desire line module builder.

Tranplan Input (TPCARD1): The TPCARD1 DOS input window (Figure 6-16) requires the user to input the name of the binary file containing the origin/destination data file. This file is created as part of the default module builder (see the **Tranplan Model Run** section), and is named *tot90x.trp*. TPCARD1 also requires the output file be named. This name can be named on a scenario basis, however, the default name that the interface default searches is *odfile.dat*. If this default name is not used, then the user must enter the selected output file’s name in place of the default filename of *odfile.dat* in the desire line input window (see Figure 6-17). **Note: The entire file name and file path must be entered into TPCARD.**

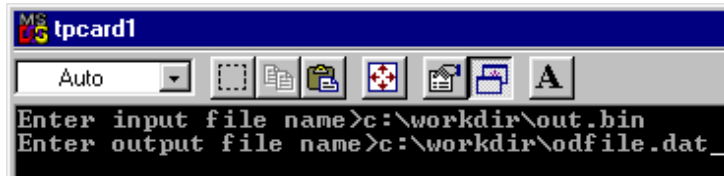


Figure 6-16 TPCard

Input (User): Desire Line’s input window (Figure 6-17) prompts the user to input an output file from Tranplan, along with the number of both the origin and destination TAZ. The first input box (**Please Input the Name of the File Containing the Origins/Destinations Data from Tranplan**) prompts the user to input the output file from Tranplan that contains the origin and destination data. A default value, *odfile.dat* (see Figure 6-18 for an example) is given, but the input file’s name is the name the user specifies as the output of *TPCARD1.EXE*. However, users that do not use the Default Module Builder must have run the Report Matrix module during their Tranplan model run, and must use the output of Report Matrix as the input for TPCARD1, then use the output of TPCARD1 as the input for Desire Line. A browse button is supplied to allow users to navigate to the required input file. The remaining input boxes (**Enter the Number of the TAZ that you wish to use as the Origin of the Desire Line** and **Enter the Number of the TAZ that you wish to use as the Destination of the Desire Line**) prompt the user to input the respective TAZ numbers for the origin and destination of the desire line.

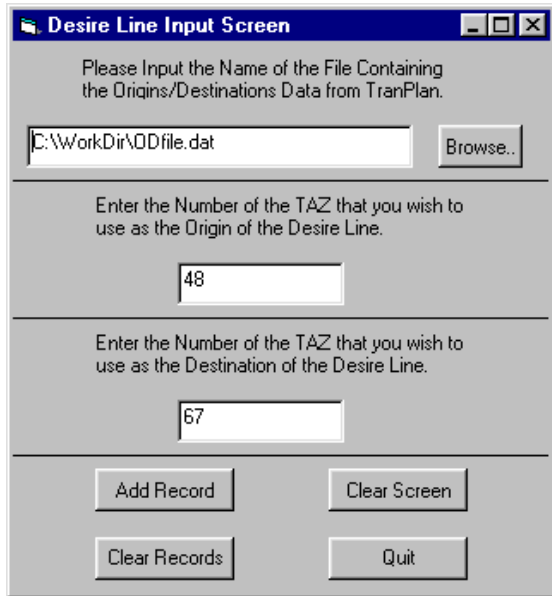


Figure 6-17 Desire Line Input Screen

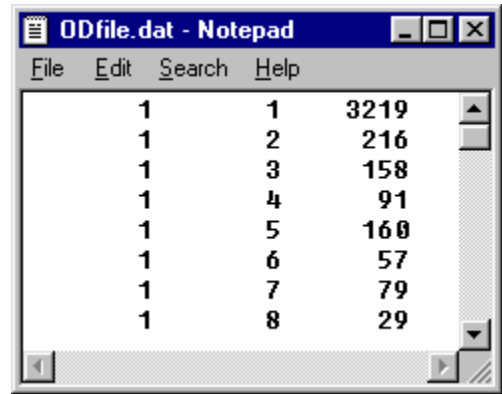


Figure 6-18 *Odfile.dat* Example

Input (Default): Three files are called by Desire Line. These files include *dirtree.txt* (Figure 4-10), *taz.txt* (Figure 4-13), and *nodes_ex.txt* (Figure 5-3).

Usage: To produce a desire line, press Add Record to run the program. When the program is completed, the input window will remain the active window. By entering another origin and destination, then pressing Add Record, multiple sets of desire lines will be stored to the output file *desire.geo*, beginning with the first run, and ending with the last run. This allows the user to create a set of desire lines by only having to navigate through the entire program one time. To clear all the previous data stored in the *desire.geo* file, press Clear Records. To clear the data on the input window, press Clear Data. Once all the required desire lines have been constructed, press Quit to exit the program. See Figure 6-17 for a display of the Desire Line input window. Note: Only one TAZ can be included as the origin or destination.

Output: Only one file is produced from the Desire Line program, however, this file may contain several sets of records, depending upon the number of times of execution before ending the program. An example of this file, named *desire.geo*, can be found in Figure 6-19.

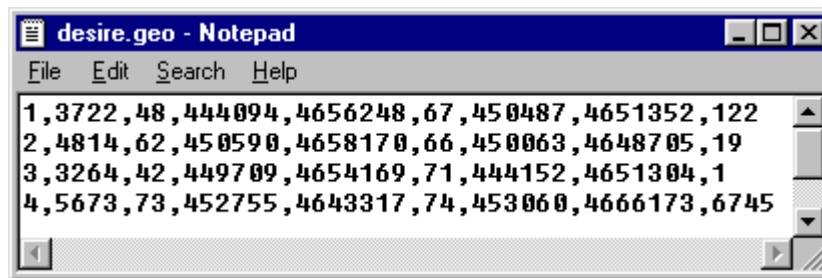


Figure 6-19 *Desire.geo* Example

The interface converts *desire.geo* into an ArcView shapefile, called OD Desire Line. Individual desire lines are displayed according to the loaded volume that the model has assigned to travel between the origin and destination. Therefore, each line is colored according to a predetermined scale. An example of desire lines, including a breakdown of the ranges of loaded volumes can be found in Figure 6-20.

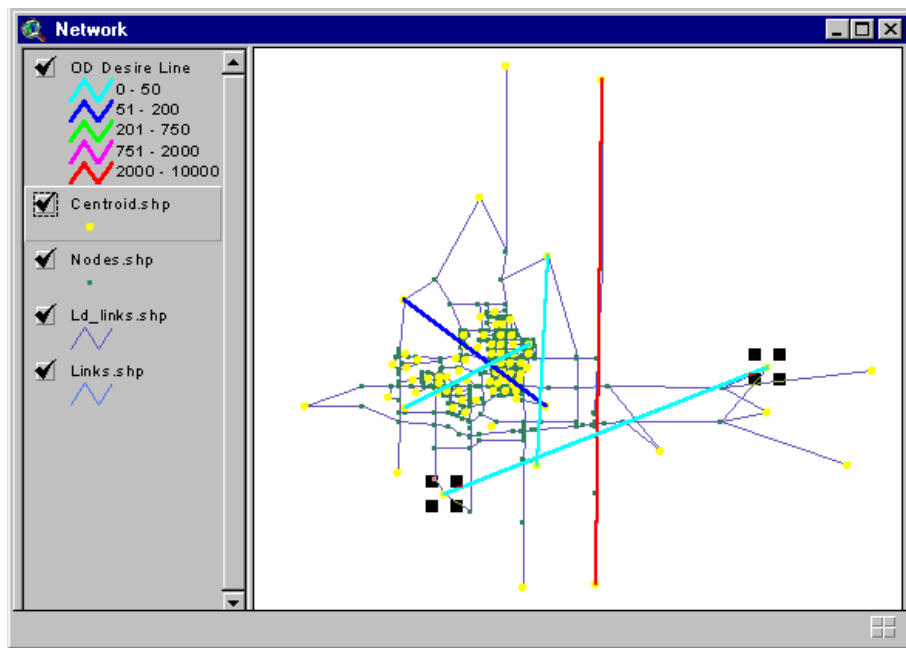


Figure 6-20 View Showing OD Desire Line Shapefile Example

6.5 Analysis Tools – “Screen/Cut Lines”

Description: The Screen/Cut Line Analysis Tool allows the user to create one or more line segments that cross one or more links in the scenario’s network. These line segments, called cut lines, are to be drawn so as to intersect with links that the user would like to compare as part of the validation process. The output from the interface, called the screen lines, will give data related to the links that the cut line crosses. Each cut line constructed by the user will result in a separate screen line data table and shapefile.

Quick Instructions:

1. Select the Analysis Tools – “Screen/Cut Lines” pull-down menu option.
2. Using the polyline draw tool in ArcView, draw up to ten screen, cut, or cordon lines, then press the Screen/Cut Line Continue Button, shown in Figure 6-21.

Input (ArcView): By selecting the Screen/Cut Line option from the Analysis Tools pull-down menu, the interface will prompt the user to construct lines using the draw line tool. These lines, called cut lines, are to be part of the newly created shapefile, *cutline.shp*. The interface will allow the user to construct up to twenty cut lines, and each cut line may cross an unlimited number of links. The links that are crossed by a particular cut line make up the screen line shapefile for that cut line. Figure 6-21 shows the creation of cut lines in the *cutline.shp* layer. Notice in Figure 6-21 that a new tool, called the Screen/Cutline Continue button, has been created in the toolbar. Once all desired cut lines have been constructed, the continue button will initiate the remainder of the program.

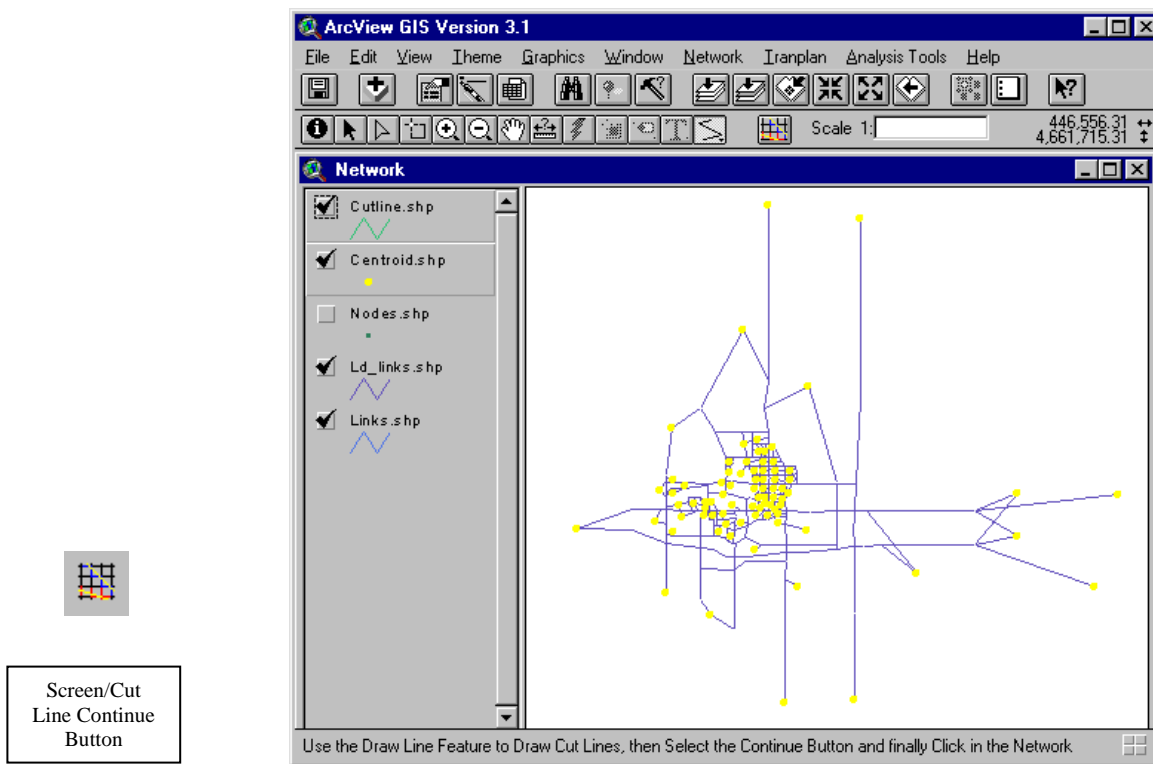


Figure 6-21 ArcView Creating Cut Lines in the *Cutline.shp* File

Output: A shapefile is created by the interface for each set of screen lines that are produced by a particular cut line. These shapefiles contain the links that make up the screen lines, along with capacity and loaded volume data. Also, a ratio of loaded volume versus grounded counts is displayed for each screen line. Figure 6-22 shows the screen line shapefiles, along with the output tables for two of the screen lines.

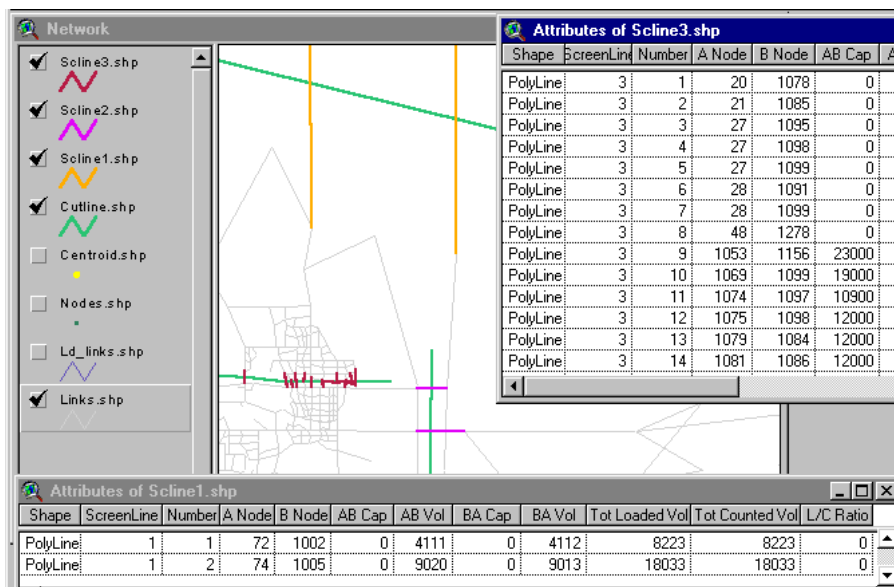


Figure 6-22 Screen Line Shapefiles and Tables

6.6 Analysis Tool – “Turning Movement Display”

Description: The Turning Movement Display option allows the user to select up to ten intersections to display the modeled turning movement volumes. The interface creates a shapefile for each selected intersection, with an arrow indicating each turning movement, along with an attribute table containing the turning volumes. By using ArcView’s theme>auto-label, the turning volumes can be labeled.

Quick Instructions:

1. Select the Analysis Tools – “Turning Movement Display” pull-down menu option.
2. Choose up to ten intersections using ArcView’s Select Feature tool while holding down the shift key, then press the Turning Movement Continue Button, as shown in Figure 6-23.
3. Select Yes if the Tranplan output file in binary form has been run through Turns.exe. If the binary file has not been run through Turns.exe, refer to Figure 6.25 for assistance. Then enter the output file from Turns.exe into the input window and press OK.
4. Press OK to continue.

Input (ArcView): To display the modeled turning movements for an intersection, use the Analysis Tools>Turning Movement Display pull-down menu. First, the interface prompts the user to select up to ten nodes where turning movements are desired (Figure 6-23). Up to ten nodes may be displayed at one time. Once the nodes are selected, continue the process by pressing the turning movement continue button. The interface then asks if the Tranplan model run output file (out.bin if using the default control file) has been run through Turns.exe (Figure 6-24). For a particular model run, the output file need only be run through Turns.exe once. Using the “*turning movement display*” multiple times does not require running *Turns.exe* multiple times. Refer to the Input (Turns.exe): paragraph for instructions on operating *Turns.exe*. If the output file has been previously run through *Turns.exe*, the turning movement shapefiles will be displayed.

Input (Turns.exe): If the output file has not been run through *Turns.exe*, then the interface executes *Turns.exe* (Figure 6-25). Next the interface prompts the user to specify the name of the output file from *Turns.exe* (Figure 6-26). The interface then returns to the “*turning movement display*” program.

Turning Movement
Display Continue
Button

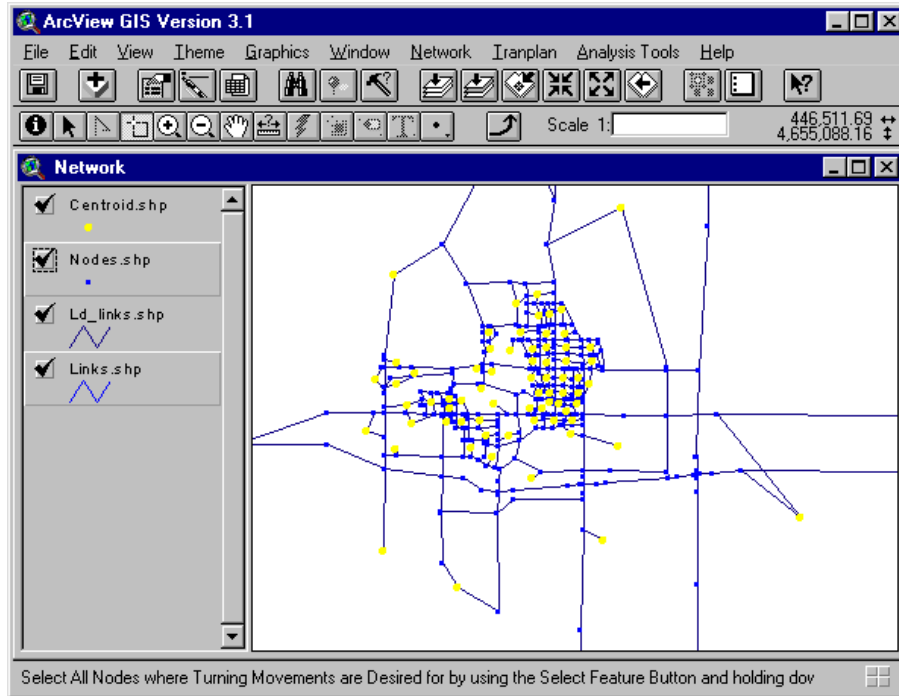


Figure 6-23 Selecting nodes for turning movement display.

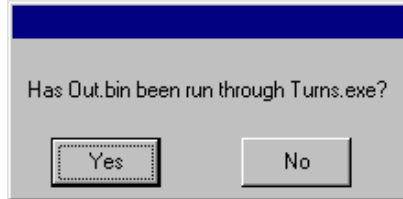


Figure 6-24 Turns.exe prompt

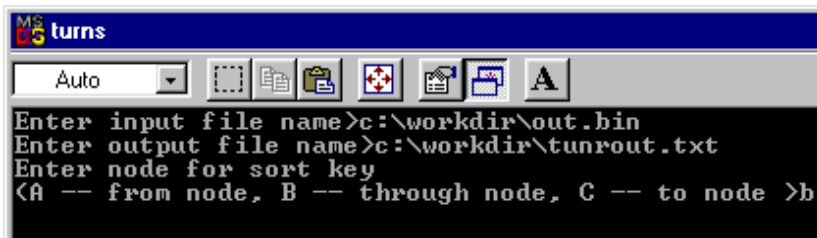


Figure 6-25 Turns.exe input

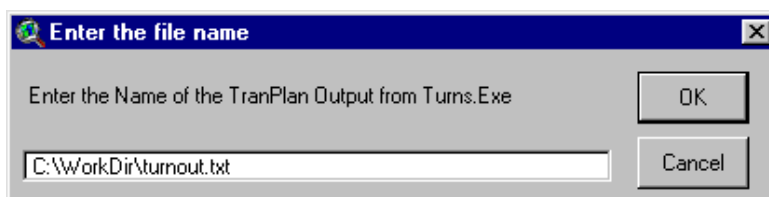


Figure 6-26 Turns.exe output prompt

Output: Shapefiles containing turning movement arrows, along with attribute tables containing the thru node, from node, to node and volume are created for the selected nodes. The shapefiles and attribute tables are named according to the order of selection, starting from zero. Figure 6-27 shows an example of the “Network” view containing *Turns0.shp* and its associated attribute table.

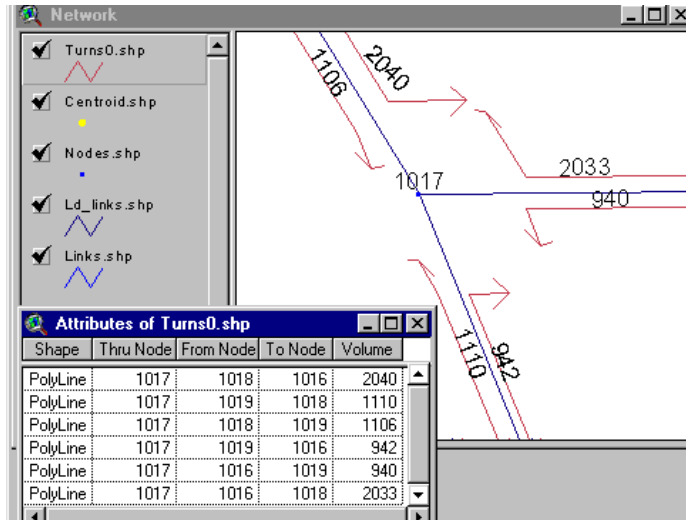


Figure 6-27 Turning Movement Display Output

6.7 Analysis Tool – “Time Radius Builder”

Description: By selecting a node in the network, along with a travel time, a shapefile will be produced containing all the points in the network that can be reached in the specified amount of time.

Quick Instructions:

1. Select the Analysis Tools – “Time Radius Builder” pull-down menu option.
2. Select a node by using ArcView’s Select Feature Button, then press the Time Radius Continue Button as shown in Figure 6-28.
3. If a previous time radius was not completed, a field error message will appear. Press OK to allow the interface to correct the problem.
4. Enter the travel time through the network and press OK.

Input (ArcView): To display the time radius for an intersection or centroid, use the Analysis Tools-“Time Radius Display” pull-down menu. First, the interface prompts the user to select the node where the time radius is to begin (see Figure 6-28). **Note:** If the time radius display was initiated previously, but was not completed, an error message (Figure 6-29) will appear notifying the user that a field in the Ld_links attribute table was found and removed. This is caused by not completing the time radius programming which automatically deletes the added field. Finally, the user is prompted to input the number of minutes to be traveled through the network (Figure 6-30).

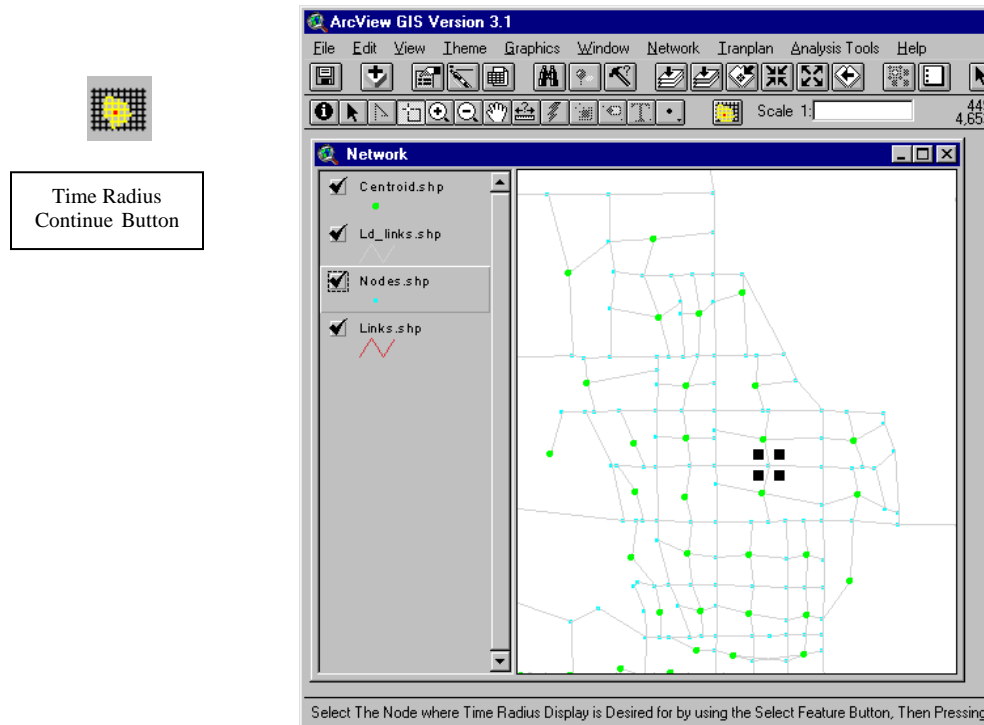


Figure 6-28 Selecting node for time radius display

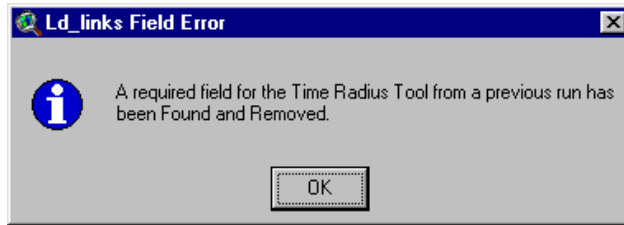


Figure 6-29 Field Removal Error

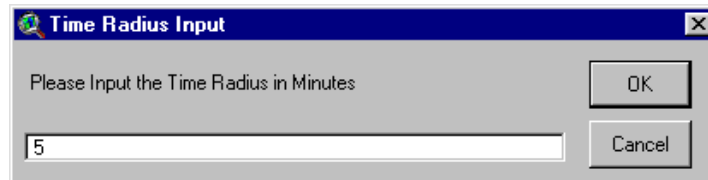


Figure 6-30 Time Radius Input

Output: The interface creates a shapefile, entitled *Timeradius.shp* along with an attribute table (Figure 6-31). The shapefile contains the portion of any link that can be reached from the selected node in the giving amount of time. The attribute table shows the amount of time needed to travel to a particular link in the Timeradius shapefile. The time is calculated by dividing the link's distance by the modeled speed of the link.

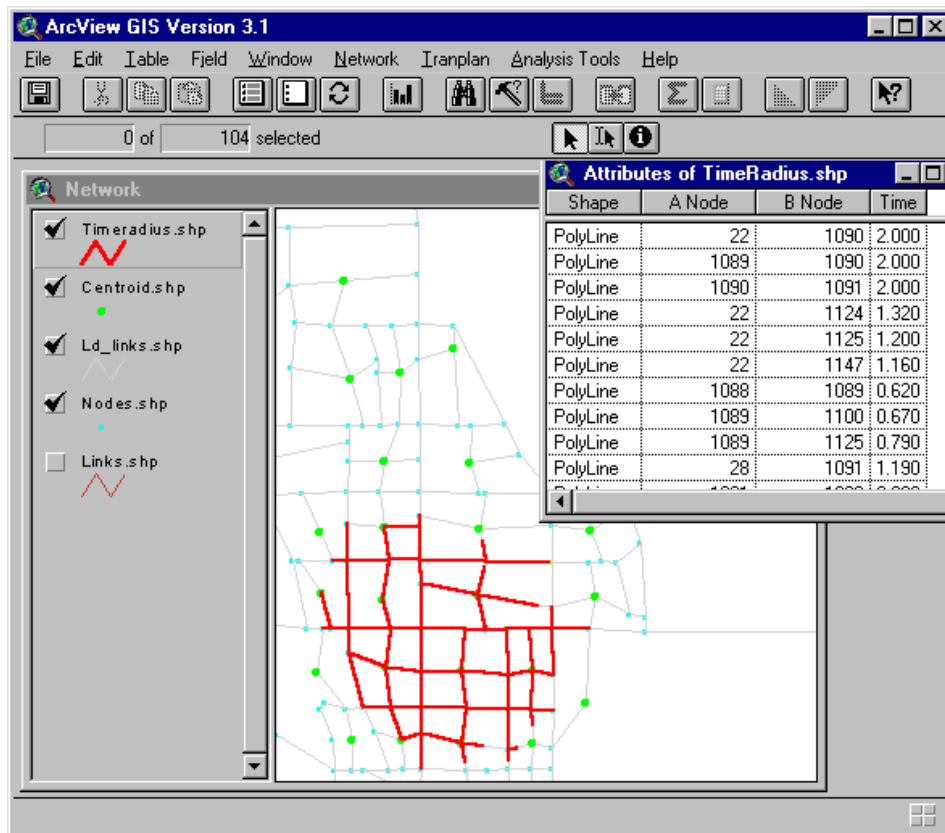


Figure 6-31 Timeradius output

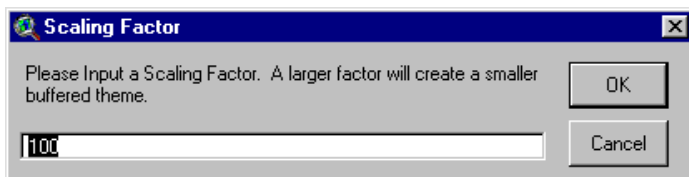
6.8 Calibration – “Calibration Plot”

The calibration plot provides a user with the ability to quickly display the predicted volumes from Tranplan in a visual format. To start this tool, click on the menu option Analysis Tools-“Calibration Plot”. This will create a buffered shape file of *Ld_links.shp*. The predicted volumes from Tranplan are used to determine the size of the buffers. The buffered links are also thematically mapped to help distinguish between different levels of volume.

Quick Instructions:

1. Select the Analysis Tools – “Calibration Plot” pull-down menu option.
2. Select the Scaling Factor to size the buffered thematic map. A smaller factor results in a larger buffer.
3. Press OK to label the theme, or Cancel to display the plot without labels.

Input (ArcView): The first step is to select a scaling factor for sizing the buffers in the thematic map. Figure 6-32 shows the scaling factor input screen. The user’s second step is to add the labels to the buffered links using the Auto-label box (see Figure 6-32). If no labels are desired,



then simply click on CANCEL. The “Label field” has been pre-set to TOTAL LOADED VOLUME, but may be changed at the user’s discretion. For more information on the other options available in the Auto-label window, please refer to an ArcView User’s Guide. If you wish to add labels and all of the options are correctly set, click **OK** to continue.

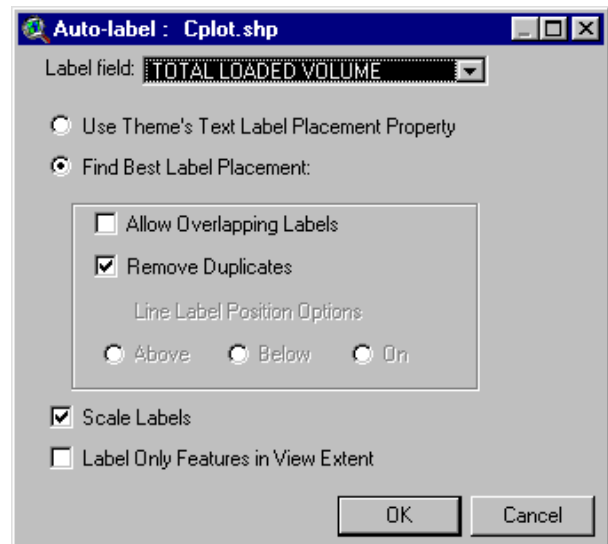


Figure 6-32 Scaling Factor for Calibration plot

Figure 6-32 Auto label of Calibration plot

Input (Default): The calibration plot requires that the *ld_links.shp* shapefile exist in the Network view frame.

Output: After the Auto-label window, the buffered shape file will automatically be displayed in the view “Network”. The name of the calibration plot shape file is *Cplot.shp* (Figure 6-33).

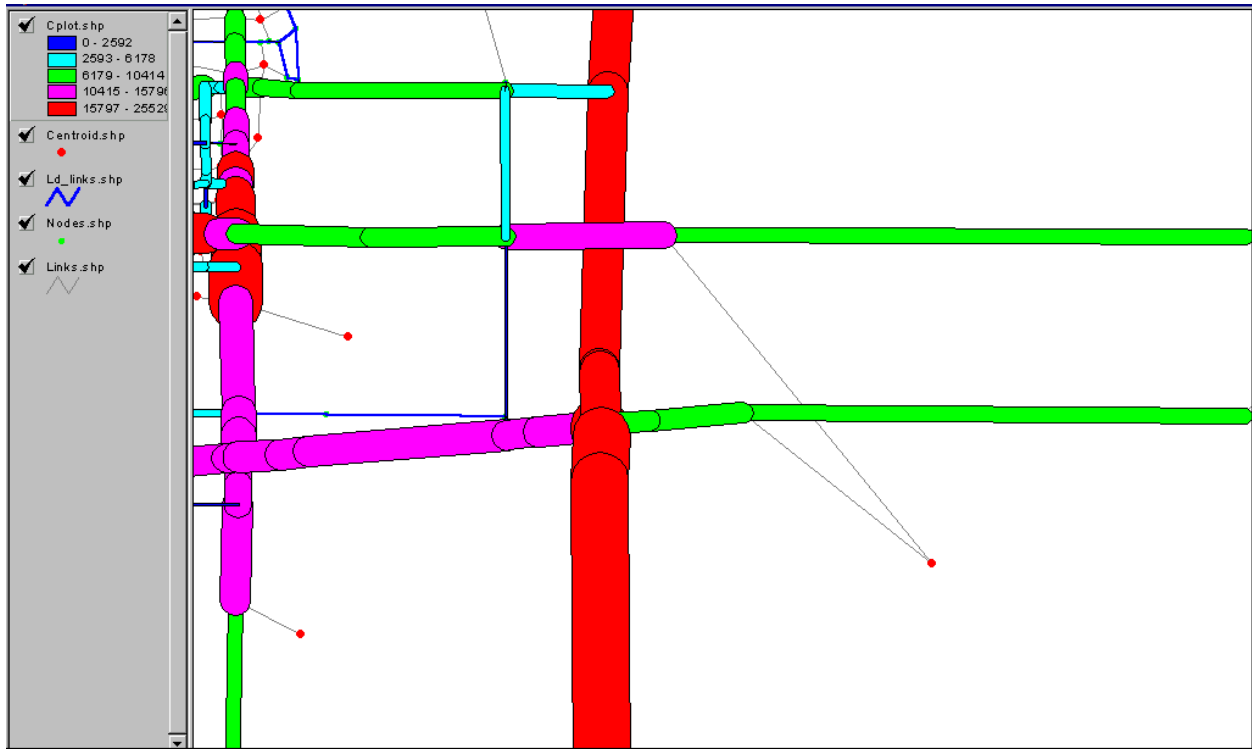


Figure 6-33 Output of Calibration plot, *Cplot.shp*

6.9 Calibration – “Validation Plot”

Description: The validation plot allows the user to visually plot all links in the network that have a modeled versus counted ratio higher or lower than a defined value. The percent difference between the modeled and counted volume is specified for ratios that are both too low and too high. Note: The counted volumes must be added in the links attributes table before beginning the Tranplan modeling phase.

Quick Instructions:

1. Select the Analysis Tools – “**Validation Plot**” pull-down menu option.
2. Select the ‘greater than’ and ‘less than’ tolerances and press **OK**.
3. Select the scaling factor for creating the buffered thematic map. A larger factor will create a smaller buffer.
4. Press **OK** to label the validation plot, or **CANCEL** to view the plot without labels.
5. Verify the legend editor is correct, and press **Apply**.

Input (ArcView): The first step is to choose a tolerance for when the Tranplan model volumes are greater the traffic counts. To set the tolerance value, click on the desired percentage value from the list provided in Figure 6-34. Repeat the procedure when model volumes from Tranplan are less than the counted volumes (see Figure 6-35). Then select a scaling factor for creating the buffered thematic map (Figure 6-36). **Note:** To recreate the thematic map with a different buffering value, the validation process must be repeated. Next, verify ArcView’s auto labeling is correct, then press OK to label the *Vplot.shp* theme, or close the window to view the unlabeled plot. Note that the links that have no ground count data appear pink. To add ground counts, refer to section 4.2 “Tranplan Text Network”.

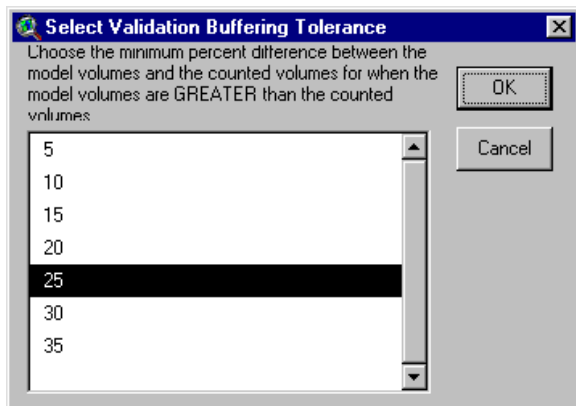


Figure 6-34 ‘Greater Than’ Tolerance

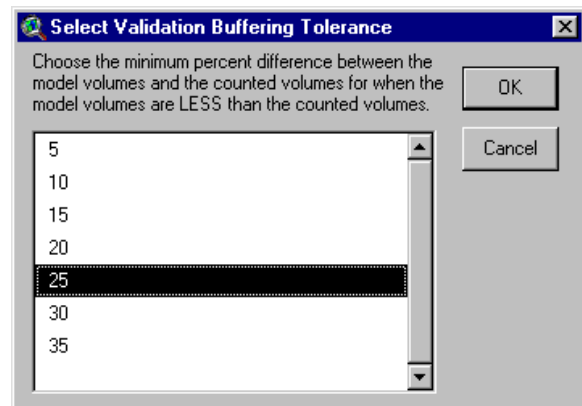


Figure 6-35 ‘Less Than’ Tolerance

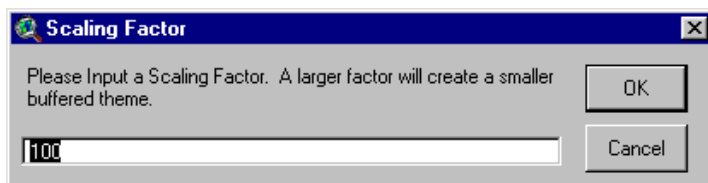


Figure 6-36 Scaling Factor for Validation Plot
Validation Plot

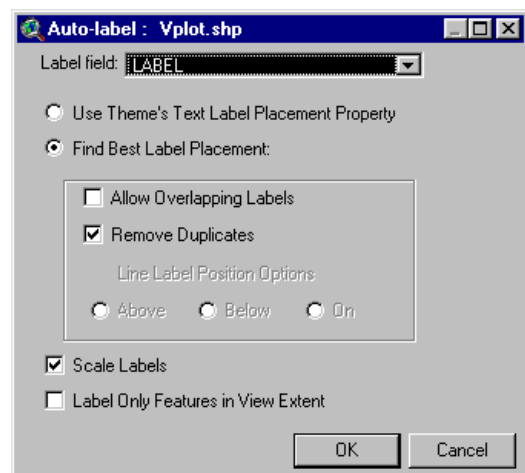


Figure 6-37 Auto-Label of

Input (Default): The validation plot requires the *ld_links.shp* shapefile exist in the Network view frame.

Output: The validation plot buffers the links in the *ld_links.shp* shapefile according to whether the links have too much or too little loaded volume compared to counted volume. Figure 6-38 shows an example of *cplot.shp*.

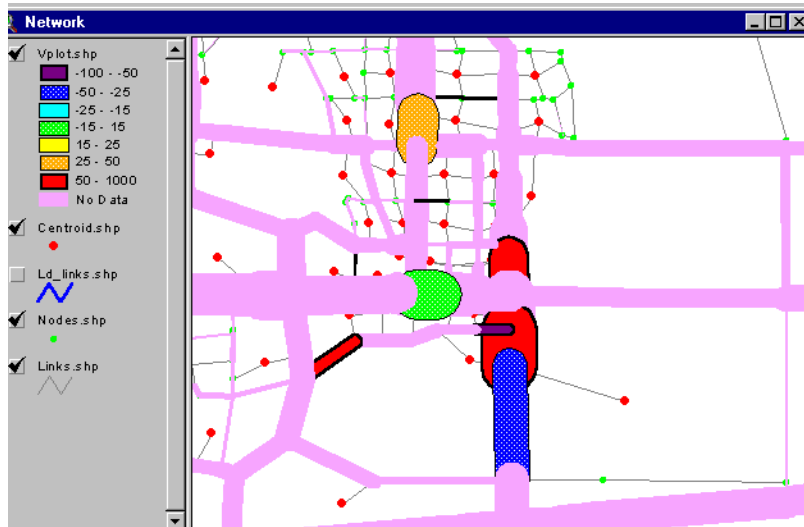
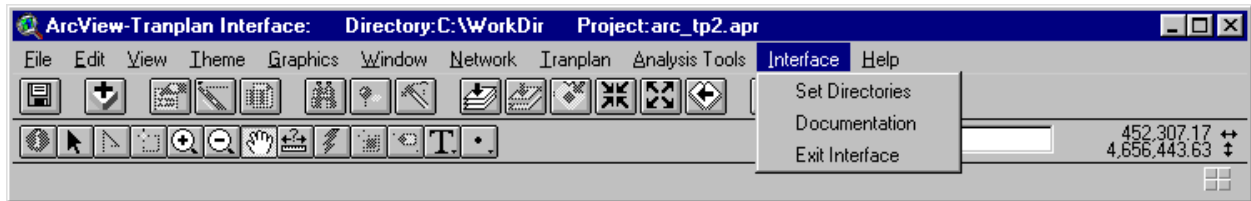


Figure 6-38 Validation Plot *Vplots.shp* Example

7. Using the Interface: Interface Control – “Interface”



7.1 Set Directories

Description: This function allows the user to reset the Tranplan, Visual Basic tools, and working directories.

7.2 Documentation

Description: This option opens a window in ArcView containing a shortened version of the User's Manual, which can be viewed while working with the interface.

7.3 Exit Interface

Description: The exit function prompts the user to save the progress made on the open ArcView project before exiting the interface. Using the exit function will not close ArcView, but instead reset ArcView to a standard operational mode.

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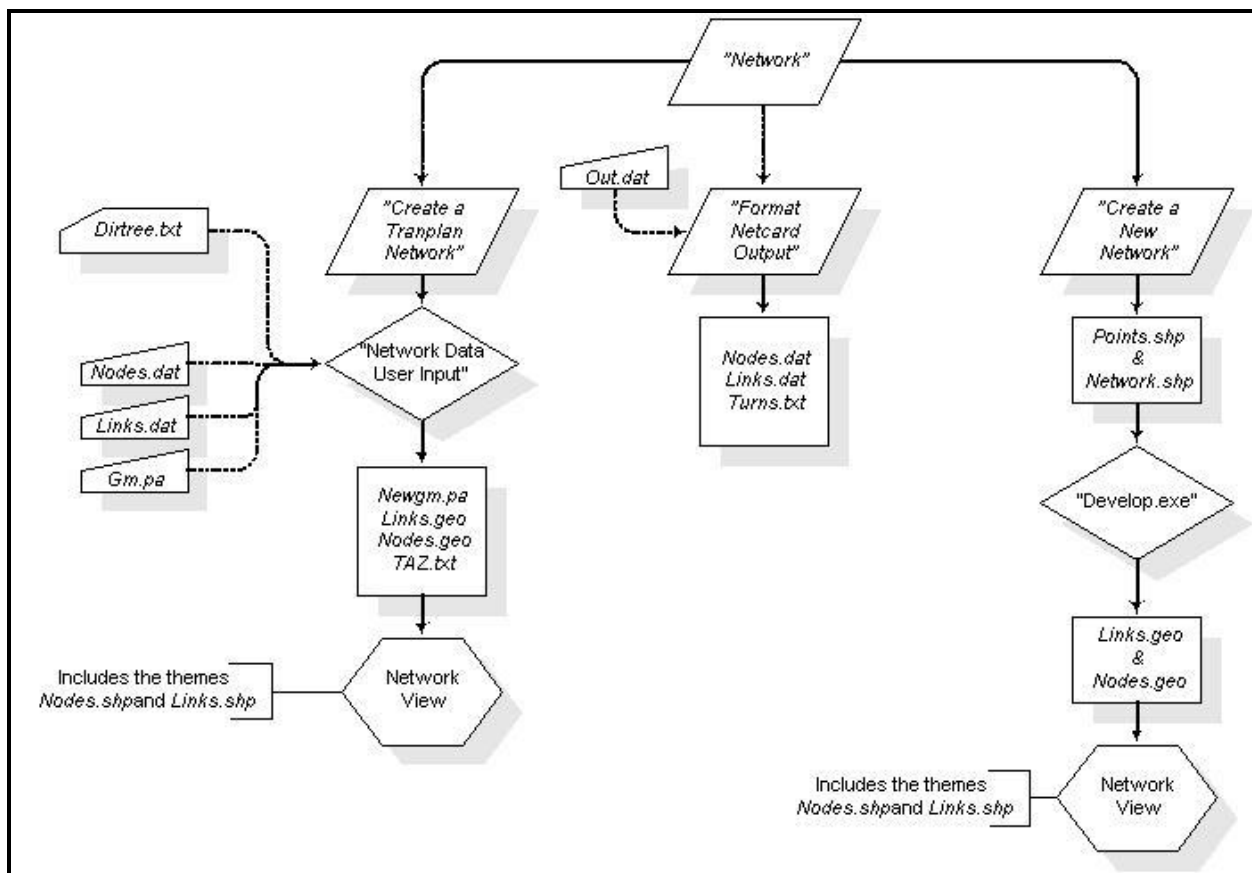
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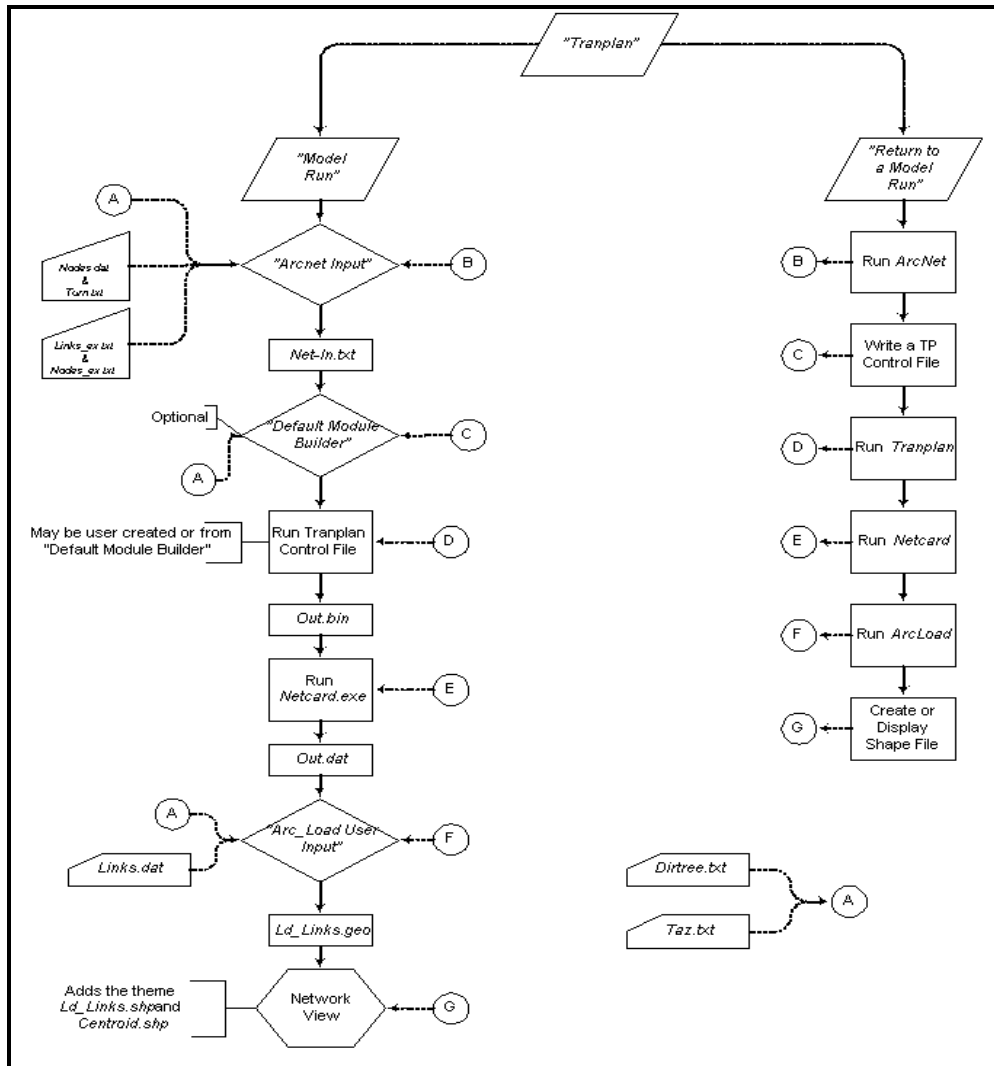
Tranplan User's Manual, URBAN/SYS, version 9.0, Urban Analysis Group, Inc., Danville, California, Copyright 1988-1998

Using ArcView GIS, Environmental Systems Research Institute, Inc., 380 New York Street, Redlands, California, Copyright 1996

10. Appendix A:



Flowchart #1: Displaying a Network in an ArcView view



Flowchart #2: Completing a Model Run